THE DENTAL PRACTITIONER

and

DENTAL RECORD

Including the official reports of the British Society of Periodontology, the British Society for the Study of Orthodontics, the European Orthodontic Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the British Society of Dental Hypnotists

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THE DENTAL PRACTITIONER
AND DENTAL RECORD

Vol. VI, No. 1 September, 1955

EDITORIAL

FIFTH ANNIVERSARY

FIVE years may not be a long time, but it is a milestone—albeit a small one—in the life of a journal. Looking back over the past five years we are confident that all the hard work necessary for the production of a scientific journal has been worth while. Changes will no doubt take place in the next five years as they have done in the past, but basically the journal will always remain true to its primary ideal—that is, to serve the practitioner of dentistry in the scientific aspect. It is this principle that will form the fundamental character of the journal. Character is a subtle affair and grows with the accumulation of past actions. To a certain extent these actions are controlled by two factors, the moral and the materialistic. On the material side the journal must live, and to do this it must pay its way and balance its books the same as any other business. Morally we have a duty to the profession and through them to the community at large. These two must obviously be balanced, and the balance will ultimately determine the character of the journal.

The journal is published to assist the dental surgeon in the widest sphere of his work. It is published to stimulate thought and educate the profession in their daily task of attending to their patients. The annual volume of twelve issues may be looked upon as a post-graduate course. We have completed five such volumes and each contains a diversity of articles ranging over the whole field of dentistry. It may be thought that at times we have concentrated too much on particular aspects of dentistry to the exclusion of more general topics of interest to the general practitioner. No journal can publish material that it does not possess, and we are very conscious of this problem. While we shall press for more articles of a general nature, it is hoped that those members of the profession who are approached will respond as willingly as their predecessors have done in the past. We admit that it is no easy task to write one's ideas and aspirations on paper. Each one of us has, however, a duty to our profession which includes the impartation of knowledge to our fellow practitioners. Opponents as well as friends have a right to be heard provided that all in their individual ways are seekers after truth. We must always aim for something better; we are neither complacent nor are we satisfied—we wish to present the best while realizing that there ought to be something a little better just around the corner.

BITE ANALYSIS AND SELECTIVE GRINDING IN DENTAL PRACTICE

By **J. R. TROTT**, B.D.S., and **A. BRYAN WADE**, B.Ch.D., F.D.S. R.C.S.
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BITE analysis is a study of the functional occlusion of the teeth. The relationships of the teeth during function can often be accurately analysed clinically. However, there are times when it is impossible to observe the cusp-fossæ relationship in function by this method alone, and it is then advisable and necessary to analyse critically the occlusion on an adjustable articulator. It must be realized that the study of articulated models is only an aid to diagnosis and, like the X-ray, should be used in conjunction with the clinical examination of the patient, so that the final treatment plan is established with the object of producing occlusal equilibration.

Glickman (1953) states: "Occlusal equilibration is the process whereby the functional forces of mastication are distributed equally throughout the natural dentition." In most mouths it is probably impossible to achieve this ideal, but there is no doubt that the forces of mastication can be more evenly distributed by planned treatment, so avoiding probable destruction of the supporting tissues of the teeth.

Occlusal equilibration can be achieved by a variety of methods. Orthodontic treatment should not only improve the æsthetic appearance, but also aim at producing a better functioning occlusion. Selective grinding of the teeth, either by itself or in combination with tooth restorations, bridgework, and prostheses, will produce a more equilibrated occlusion. On occasions it may be necessary to extract a tooth which may interfere with the plan of a sound prosthesis or have erupted and altered the masticatory cycle.

Whatever the treatment plan may be, the object is to restore the occlusion to maximum function and eliminate as far as possible the harmful effects of occlusal imbalance.

When analysing the occlusion on an adjustable articulator, two clear facts must be borne in mind. First, normal movement of the mandible from the position of rest to centric occlusion is pure hinge in character. Secondly, in opening, once the position of rest is exceeded there is a combined hinge and sliding movement as the condyles move in the temporomandibular fossa. Further it must be realized that it is impossible to reproduce on an articulator all the movements that are executed during mastication, and all one can hope to do is to analyse the basic excursions. If, however, these movements are analysed on an articulator, and the necessary corrections made, then it is possible to use these observations with a greater degree of confidence in the mouth, where the final adjustment is to be carried out.

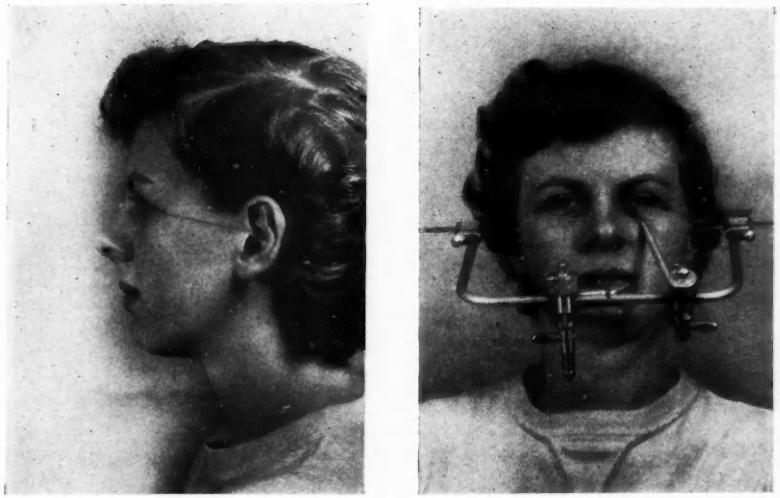
Having decided that occlusal equilibration is required, accurate Zelex impressions of the teeth should be taken and duplicate models cast in hard stone. Both sets of models should be articulated; one set trimmed to simulate the selective grinding that will be carried out in the mouth, the others kept as master models.

It is necessary to articulate the models on an adjustable articulator; which type one uses does not matter so long as it is used according to the maker's specifications. It seems a common impression that because one uses a certain technique with one articulator, this applies equally to all other types of articulators. This is not so, and the description which follows is the technique of using the Dentatus articulator and face-bow.

The Dentatus articulator has an adjustable condyle path and an orbital plane indicator. The incisal guide platform is not used in a bite analysis, though it is used in constructing prostheses. One great advantage of the articulator is that it is possible to mount numerous models on the same articulator by means of easily removable plates. The face-bow is similar to all other face-bows except that it has an additional marker, the orbital pointer.

RECORDINGS

Three recordings have to be taken from the patient to enable the models to be set on the articulator correctly before a bite analysis can be performed:—



A B

Fig. 1.—The three external markings for the positioning of the face-bow, and the face-bow in place before removal from the patient. A, The external marking on the patient's left for the condylar stud. B, Face-bow and bite fork with the orbital pointer resting on the left infra-orbital notch.

1. The relation of the occlusal plane of the maxilla to the Frankfort plane.
2. The precentric relation of the mandible to the maxilla.
3. The angles of the condylar paths.

The Relation of the Occlusal Plane of the Maxilla to the Frankfort Plane.—The Frankfort plane is determined by four points, the two poria and the two orbitale (Gould, 1951). However, because there is always a certain asymmetry in human skulls only two poria and the left orbitale are used. The porion is usually considered to be the highest point on the upper margin of the external auditory meatus and the orbitale is the lowest point on the inferior margin of the orbit. Three external markings are used to establish the Frankfort plane. On either side of the patient a point is marked 12 mm. from the tragus of the ear, along a line joining the upper border of the tragus to the outer canthus of the eye (Beyron, 1955). On the left side of the patient the infra-orbital notch should be palpated and marked. The bite fork covered in wax is placed firmly on the maxillary teeth

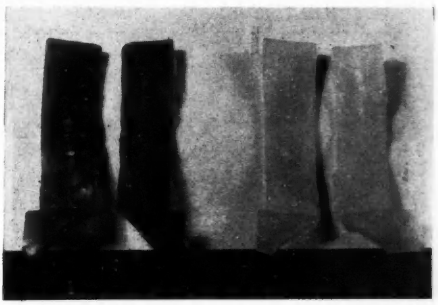


Fig. 2.—The two wax registrations. On the left the two wafers for the precentric, and on the right the protrusive.

and the mandible closes into the lower part of the wax to hold it in position, with the handle protruding from the right side of the mouth. The condylar studs on the face-bow are then set equidistant from the markings

anterior to the tragus of the ear and the nut tightened to fix the bite fork to the face-bow. On the left side the orbital pointer is placed so that its end rests on the external marking of the infra-orbital notch. It is necessary for these positions to be as accurate as possible

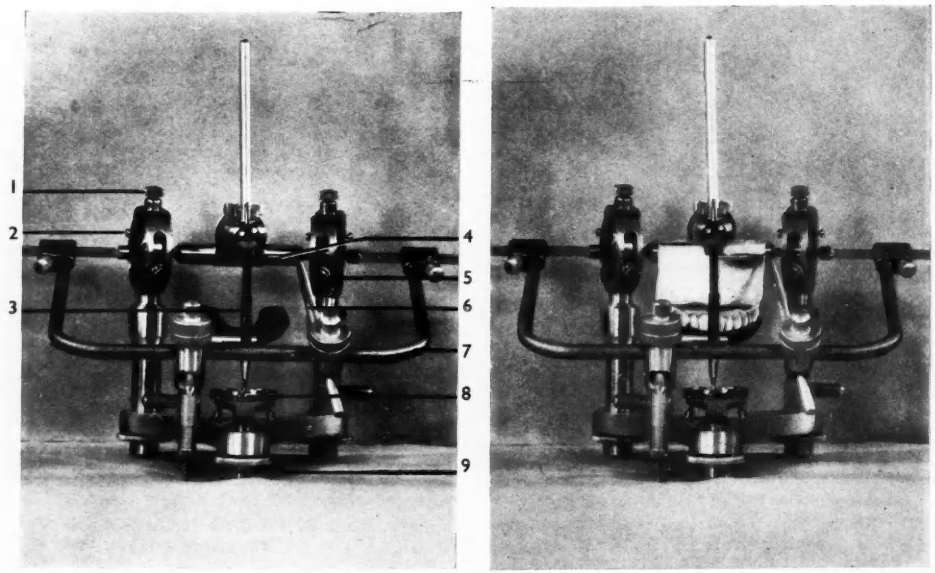


Fig. 3.—A, A Dentatus articulator with face-bow adjusted preparatory to mounting the maxillary model. 1, Condylar path screws; 2, Locking pins; 3, Incisal pin; 4, Orbital plane indicator; 5, Condylar head controlling nuts; 6, Orbital pointer; 7, Face-bow; 8, Incisal guide platform; 9, Adjustable screw for raising and lowering the face-bow. B, The maxillary model mounted.

because negligence at this stage will negate the usefulness of the bite analysis. To check that in tightening the bolt over the bite fork the face-bow has not been distorted, the bolts securing the condylar studs should be loosened, and the condyle studs withdrawn and slid back again to see that they rest over the external markings.

The face-bow and bite fork should then be removed and tried on the articulator, to make sure that the column securing the bite fork does not interfere with the incisal guide platform (*Fig.* 1 A, B).

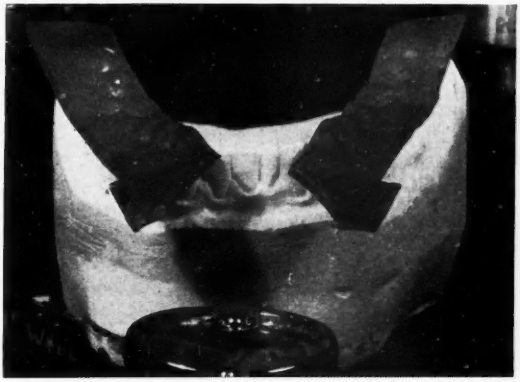
The Precentric Relation of the Mandible to the Maxilla.—In recording this relation it is necessary to understand one simple fundamental point. This recording registers a position of the mandible somewhere between that of rest and that of closed centric. Therefore there must be as little muscular effort as possible and no tooth contact. This is not centric occlusion but a precentric relation obtained to ascertain whether or not there is a premature contact.

Before attempting to take this wax recording, make sure the patient's head is upright, comfortable, and relaxed and that there is no strain on the neck musculature. Watch the patient close several times into centric and notice especially the last few millimetres of closure, and the position of the anterior teeth before contact is made.

Then, with two wafers of single-thickness, special, soft red wax (Kemdent) placed between the posterior teeth, close together with as little effort as possible and stop the closure before contact is made. Two wafers of wax are used so that the operator can see whether

or not the patient is deviating from the central line of closure and also to stop the closing process before tooth contact is made. If one horseshoe-shaped piece of wax is used it is impossible to do this. Chill the wax in the mouth with cold water and remove. Try the waxes on the models to make sure there is no contact and that the relation is the same as that recorded in the mouth and chill again in cold water (*Fig.* 2).

The Angles of the Condylar Paths.—To record the condylar path two wafers of ordinary pink base-plate wax are used. Here again, being able to see the anterior teeth



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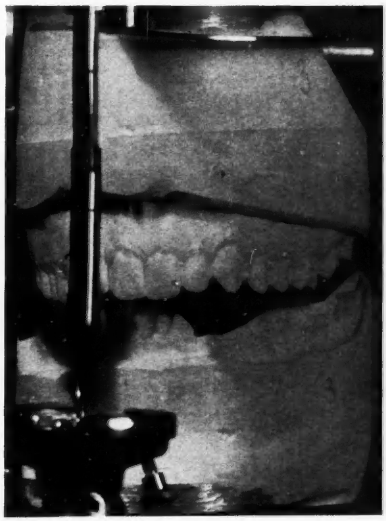


B

Fig. 4.—A, Showing the precentric wax recordings in position. B, The maxillary and mandibular models mounted.

enables one to make quite sure that the movement is a pure protrusive one, and that when the anterior teeth meet the mandible has not swung to either left or right (*Fig.* 2). If there is an edge-to-edge occlusion in centric or a more severe Angle Class III relationship it is necessary to have a recording of left and right lateral movements rather than a protrusive which has been found inaccurate.

It is now possible to articulate the models.

ARTICULATING THE MODELS

Adjusting the Articulator.—Before the maxillary model is fixed to the articulator it is necessary to set the articulator in a neutral position.

The incisal guide-pin is set at zero and the two nuts controlling each condylar head are screwed right home in a clockwise direction. The condylar path screws can be tightened in any position and the movement of the condylar ball-bearings fixed by the two locking pins (*Fig.* 3 A).

Setting the Maxillary Model to the Articulator.—The face-bow with the bite fork and orbital pointer is placed on the articulator so that the condylar studs are equidistant from the condylar bearings and the orbital pointer rests on the undersurface of the orbital plane indicator. To adjust the orbital pointer there is a screw underneath the bolt that attaches the bite fork to the face-bow which can be altered so that the orbital pointer rests on the orbital plane indicator (*Fig.* 3 A). The maxillary model is then fixed to the bite fork and secured to the articulator by plaster, making sure that the incisal pin is resting on the incisal platform (*Fig.* 3 B).

Orientating the Mandibular Model on the Articulator.—The mandibular model is related to the maxillary model by means of the

precentric waxes, and then attached to the lower arm of the articulator with plaster, again making sure that the incisal pin comes to rest on the incisal platform. It is very important when placing the two models together to ensure that they are accurately positioned in the waxes because if the models are not right home an incorrect analysis will result (*Fig.* 4 A, B).

Setting the Condylar Paths.—The setting screws for the condyle path can be loosened

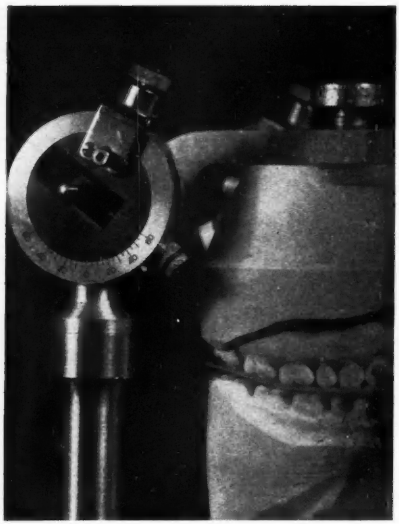


Fig. 5.—Adjusting the condylar path to the protrusive wax registrations.

and the maxillary model settled into the pink wax wafers recording the protrusive position.

The articulator is held firmly on the bench, with three fingers of one hand placed on the base of the maxillary model, whilst the other manipulates the condylar path setting screws until the two models are settled firmly into the waxes. The screws can then be tightened and the condylar path recorded from the scale on the side of the articulator (*Fig.* 5). If the condylar path has been recorded by using left and right lateral movements then each pair of waxes must be set on the mandibular model and the maxillary model settled into each movement in the same way as when a simple protrusive recording is used.

When using left and right lateral wax recordings to set the condylar path on the articulator the condylar nuts on the side opposite to the movement recorded must be released slightly. This is because there is a slight backward movement of the condyle on the working side.

The models are now set on the articulator with all the necessary data for a bite analysis.

BITE ANALYSIS ON THE ARTICULATOR

Red and blue articulating papers are needed, and a sharp knife to trim the models to simulate the selective grinding that will be carried out in the mouth.

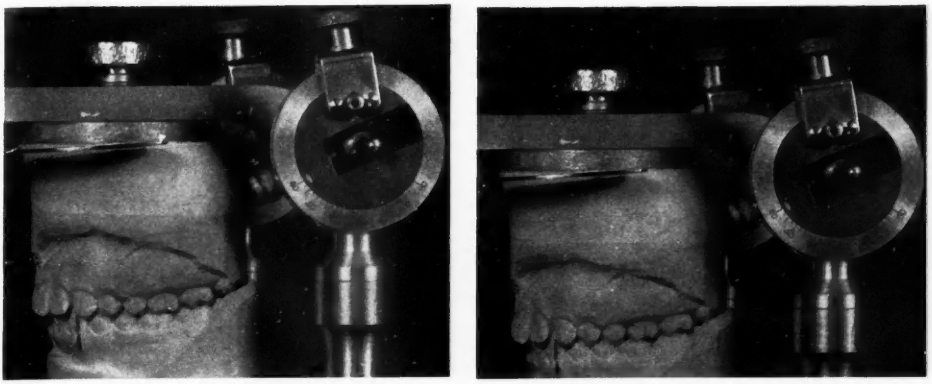
Testing for a Premature Contact.—The incisal guide-pin should be released and the two models brought together. If there is no premature contact the two models should close directly into a centric relationship without any deviation. If, however, there is a premature contact then the maxillary model will deviate until the two models are in the acquired centric relationship. This movement may be very small indeed and one of the condyle bearings will move slightly along the condyle path. This premature contact may occur on one or more teeth (*Fig.* 6 A, B).

Removing the Premature Contact.—Using two pieces of red articulating paper the two models are again brought into premature contact: The position or positions of a premature contact will be shown by a red marking.

The problem of whether to trim a cusp or a fossa to eliminate this premature contact, and so correct for centric occlusion, depends upon a lateral excursion. If in a lateral movement the offending cusp is still in contact it should be trimmed; however, if in a lateral movement there is no such contact then the fossa is trimmed. A premature contact in the anterior teeth is corrected by trimming either the mandibular incisors or canines, not the maxillary incisors (*Fig.* 7).

Only small amounts are trimmed off the teeth to correct any discrepancy, and one must constantly test with articulating paper to make sure the teeth are being trimmed in

the right places, and that a premature contact is not being transferred from one position to another. It is important when the trimming for a premature contact has been completed to mark the models to record where the trimming has been carried out, otherwise when other functional movements are corrected there may be confusion as to which teeth were trimmed. Not until the centric relation has been corrected can one proceed to an analysis of the lateral and protrusive movements.



A B

Fig. 6.—Testing for a premature contact. A, The position of initial contact. B, The two models in an acquired centric occlusion. Notice that the condylar bearing has moved backwards a fraction, thus indicating a premature contact.

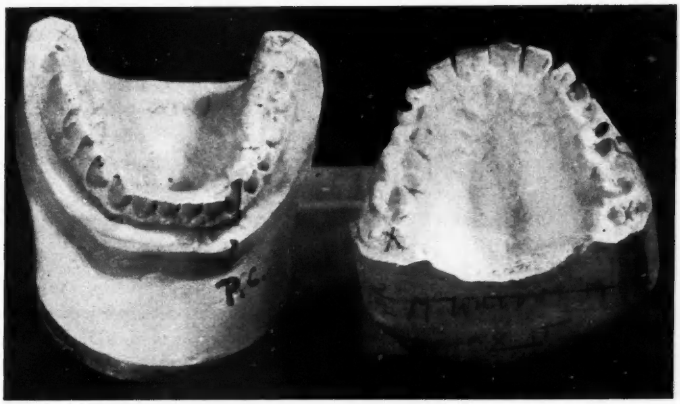


Fig. 7.—Premature contact removed from the incisal edge of $\overline{3}$.

Correction of Lateral and Protrusive Movements.—It does not matter particularly which of the three excursions are analysed first, so long as a record is kept on the models which teeth were trimmed for any particular excursion.

The degree of lateral movement need be no more than would reasonably be expected in a chewing cycle from an eccentric to a centric position. Therefore, if the mandibular and maxillary buccal cusps are in the same straight line on the working side in a lateral excursion

and the anterior teeth edge to edge in a protrusive movement, this can usually be considered the range of a masticatory movement.

The ideal in trimming the models would be to have all teeth showing some degree of contact in all working movements of the mandible. This is not always possible, however, and the object is to transfer the masticatory stresses from one or two teeth to as many as is feasibly possible on both the working and balancing sides. It is usual to get most of the buccal cusps on the working side into contact, but on the balancing side it is often impossible to get more than one or two teeth into function. In a protrusive movement one is usually able to spread the stresses over all the anterior maxillary teeth instead of one or two, but a balance in the posterior regions is rarely obtained.

It should be pointed out that although it is desirable to have almost complete contact on the working side and one or two teeth in contact on the balancing side, one should not be deterred from selective grinding if this is not attainable. It is far better to distribute the masticatory stresses over as many teeth as possible without obtaining complete gliding balance than to do nothing at all.

Two pieces of articulating paper are used for any particular movement, for example, in testing a right lateral movement, articulating paper is placed along the occlusal surfaces of one model so that there is complete coverage, making contacts on both the working and balancing sides.

The teeth are trimmed so that the vertical dimension is maintained. Vertical height is maintained by the occlusion of the lingual cusp of the maxillary teeth into the fossa of the mandibular teeth and the buccal cusp of the mandibular teeth occluding with the fossa of the maxillary teeth. Therefore, interference of movement on the working side is corrected by trimming the lingual slope of the buccal cusp and reducing the height of this cusp in the maxillary teeth, and by trimming the buccal slope of the lingual cusp and reducing the height of this cusp in the mandibular teeth. On the balancing side the reverse is possible. Similarly in a cross-bite on the working side it is the lingual cusp of the maxillary teeth and the buccal cusp of the mandibular teeth that are trimmed (*Figs.* 8 A–E).

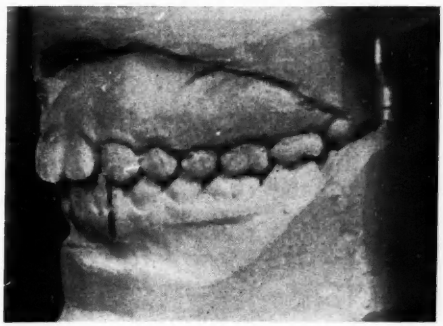
In protrusive movement it is the maxillary incisors that are trimmed not the mandibular incisors, because the mandibular teeth should occlude with the lingual surface of the maxillary teeth in centric relationship (*Fig.* 9, A–F).

The process of trimming the models is carried out by testing the movement with and without the articulating paper and cutting the plaster accordingly. It is a great advantage with articulated models to be able to view the lingual and palatal surfaces for interferences which are nearly impossible to detect in the mouth. The trimming is carried out gradually so that too much is never cut away and the amount of selective grinding very closely approximated.

SELECTIVE TOOTH GRINDING

Having carried out a bite analysis on articulated models, it is necessary to transfer the corrections to the mouth. The equipment required is a small diamond wheel stone for both straight and contra-angle handpieces, and red and blue articulating paper. The thickness of the articulating paper is purely a matter of personal taste and some people prefer to use typewriter ribbon instead of paper.

It is psychologically unsound to attempt to carry out selective grinding with a fast revolving diamond wheel without explaining the rationale of the procedure to the patient. The trimmed models should be on the bracket table, not only to act as a guide in the subsequent selective grinding, but to be shown to the patient whilst it is explained that only a very superficial part of the tooth structure is going to be removed during the reshaping process. It should be explained that this has no effect on the incidence of dental caries and that, other than a certain amount of noise, there is usually no discomfort. It should also be explained that selective grinding will reshape the surfaces of the posterior teeth so that not only is the load on the supporting tissues more



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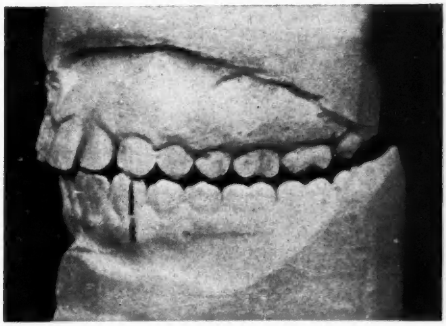

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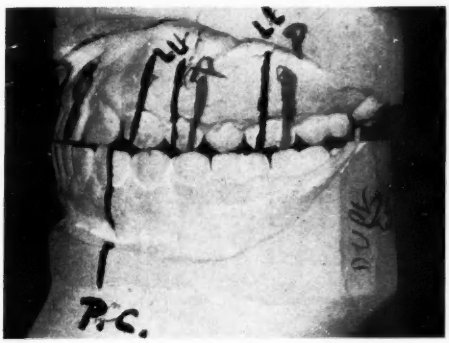

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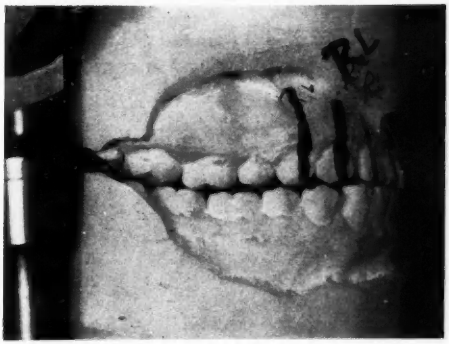


E

Fig. 8.—Selective grinding for a left lateral movement. A, Correct centric occlusion. B, Left lateral working side, before grinding. C, Left lateral working side after grinding $\frac{346}{}$. D, Left lateral, balancing side before grinding. E, Left lateral, balancing side after grinding $\frac{346}{}$.

evenly distributed, but also it will give the patient a more harmonious chewing movement. In the anterior region it more often than not improves the æsthetic appearance.

From the articulated models one knows with a certain degree of accuracy where the premature contact or contacts exist and which teeth need to be ground for the various eccentric movements.

However, the prematurity should also be checked by clinical methods. First by carefully watching the patient closing the teeth together it is possible to see the mandible deviate into an eccentric occlusion, and in some cases either the tooth causing the prematurity or one in the opposing arch will visibly move during closing of the jaws. Secondly, by placing a finger over the labial aspect of the crown and root of the tooth that is suspect, movement may be felt rather than seen. Lastly, a premature contact can be heard as a click before complete contact is made by both jaws.

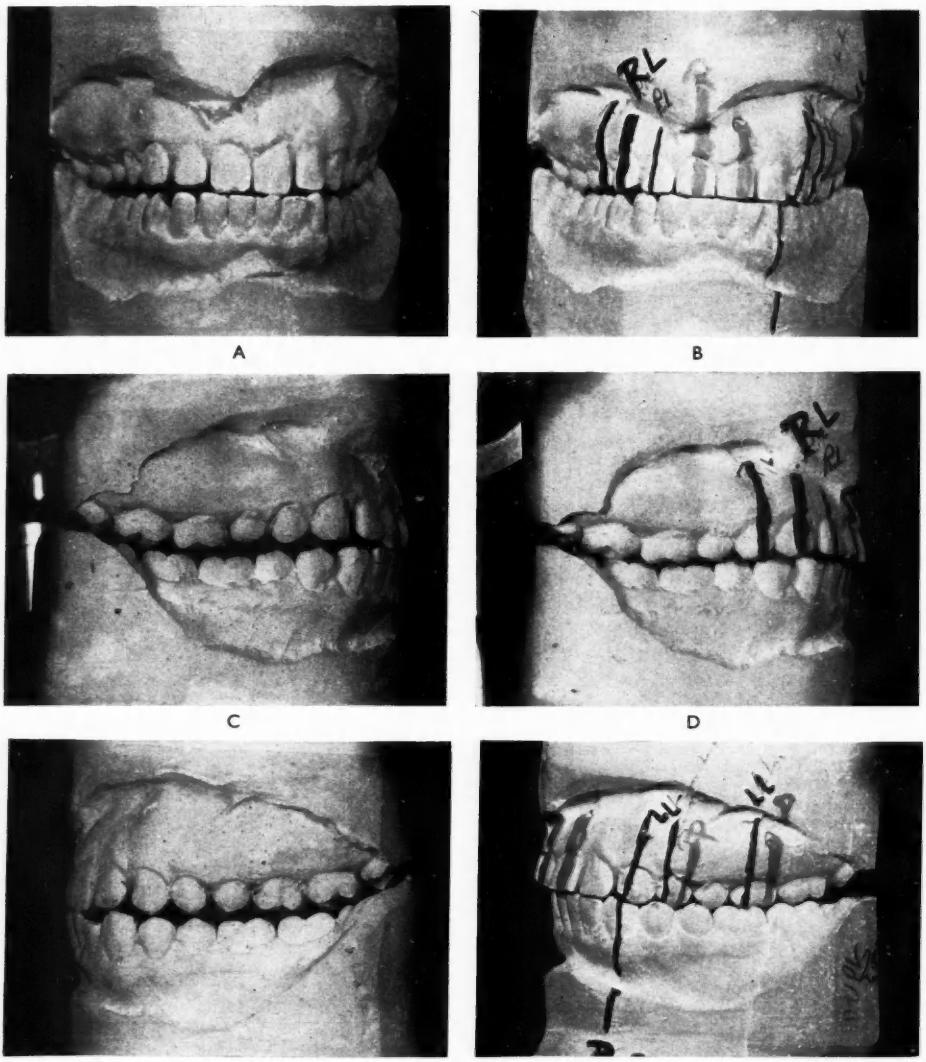


Fig. 9.—Selective grinding for a protrusive movement. A, Anterior view before grinding. B, Anterior view after grinding 1/146. C, Right side before grinding. D, Right side after grinding 1/146. E, Left side before grinding. F, Left side after grinding 1/146.

The same routine is now carried out in the mouth as performed on the articulator. Teeth should be dried with gauze, two pieces of red articulating paper inserted, and the patient asked to close. Prematurity is removed by grinding either cusp or fossa, as on the models.

Two pieces of articulating paper are always used for all movements. If only one piece is

used the patient will be tempted to deviate to the side where the paper is placed. The diamond stone should be placed on the tooth for only short periods of time, and the cutting carried out at high engine speeds, 8–10,000 r.p.m. Not too much tooth structure should be removed at any one time, and frequent checking with articulating paper is necessary. The removal of the premature contact and the establishment of true centric occlusion should be observed carefully by clinical methods as outlined previously. The tooth being ground should be supported by a finger from the non-operating hand so as to reduce the effects of vibration. Tooth anatomy should be maintained as far as possible, and in most cases only cusp height and the inclination of the planes altered. In the anterior region the maxillary incisors should be ground with a lingual bevel at the incisal edge, and when it is necessary to grind the mandibular incisors a labial bevel should be used.

It is not enough to ensure that at a particular static phase of a lateral excursion more teeth are in contact than there were prior to the selective grinding. The actual functional movement from a centric to an eccentric position must be carried out by a harmonious gliding contact of the tooth surfaces in both dental arches. There must be no irregularity in the reshaping of the occlusal surfaces such that would cause a jerky movement and a jiggling of the teeth, only a smooth continuous gliding contact during the functional phases of the masticatory cycle.

If quite an amount of selective grinding has to be carried out then it is probably best to do it in two or more stages. If it is intended to perform the necessary grinding in two stages then the protrusive excursion should be corrected first and both lateral excursions at a subsequent visit. It is possible to correct only one lateral excursion and leave the patient in considerable discomfort until the other lateral movement is corrected. This should be avoided by either correcting both at the same time or only a little of both at a visit, completing the grinding later.

The routine to be followed in selective grinding is precisely the same as on the articulated models. One movement at a time is checked with articulating paper; using the models as a guide the teeth are ground in the appropriate areas.

It is not an operation that can be performed quickly with certainty, and it is far better to remove just the right amount of tooth tissue by constant checking with articulating paper and a little grinding at a time, rather than too much grinding and then have to try and correct the whole occlusion.

On completion of the grinding the teeth should be polished with brushes and paste so that all surfaces are smooth and no sharp edges are left.

SUMMARY

A method of bite analysis has been outlined and the process of occlusal equilibration by selective grinding described.

REFERENCES

BEYRON, H. J. (1955), personal communication.
GLICKMAN, I. (1953), *Clinical Periodontology*. London: W. B. Saunders Co.
GOULD, G. M. (1951), *New Gould Medical Dictionary*. London: H. K. Lewis & Co. Ltd.

A Technique for Reattachment

The problem of reattachment of the periodontal tissues is well considered by the author, who analyses a clinical problem as being, first, complete and total elimination of the epithelial lining of the soft wall of the pocket and of the epithelial attachment; secondly, complete sterility of the lumen of the pocket and the adjacent tissues; and thirdly, maintenance of sterility while the clot is being organized.

A technique using penicillin to maintain the sterile condition is described and of 103 cases treated by this technique, 57 showed a return to normal in the gingival tissues with only slight residual pocketing and tightening of mobile teeth; 41 showed similar improvement, but notable reduction of the pocket depth, and 5 were complete failures. Convincing radiographic proof is supplied and the author states his belief that radiographic evidence of reattachment must be accepted, if it is in conjunction with clinical evidence.—CARRANZA, F. A. (1954), *J. Periodont.*, **25**, 272.

THE RELATIONSHIP OF THE LIP LINE TO THE INCISOR TEETH*

By W. A. NICOL, L.D.S., D.D.O.

WHILE it is known that the muscles surrounding the teeth influence the position that the teeth will adopt, their study has been confined almost entirely to their function (Ballard, 1948, 1953; Gwynne Evans, 1948; Rix, 1946, 1953; and others). It is obvious that in function the muscles exert a more powerful and more dynamic influence. Hovell (1955) suggests that the lips and cheeks at rest fulfil a passive role and that the size and shape of the tongue determines the shape of the dental arches.

Fig. 1.—An example of a profile X-ray with barium paste, showing up the surfaces of the lips in the midline.

When the teeth erupt, they erupt into a space between the tongue on the inside and the lips and cheeks on the outside. The shape of this space is variable from individual to individual, as are all human features. But the extent and the manner of its variation has not been investigated. The shape of the inner surfaces of the lips and cheeks, even if only fulfilling a passive role, must have some effect on the position which the teeth will adopt.

The inner surfaces of the lips form the anterior boundary of this space into which the teeth erupt, and offer a suitable starting point for study. In a preliminary survey (Nicol, 1954) the relationship of the lips to the incisors in cases of deep overbite was observed clinically. The lower lip was observed to cover part and, in some cases, all of the labial surfaces of the upper incisor teeth. Pringle (1955) has since made some valuable observations on the combined effects of the lip seal, the height which the lower lip reaches on the upper incisors, and the type of swallow, in cases of treated Angle's Class II, division 1 malocclusion.

In the present paper it is proposed to investigate the relationship of the lip line to the upper incisor teeth in a representative group of schoolchildren, to establish the relationship existing in normal occlusion, and to investigate the relationship in cases of malocclusion.

METHOD AND MATERIAL

A random sample of 44 schoolchildren attending Bristol Dental Hospital for routine dental treatment provided the material for the principal part of the investigation. Their ages ranged from 9 years to 14 years. Of the 44, 30 had normal occlusion, 8 had an Angle's Class I malocclusion, 3 Angle's Class II, division 1, and 3 Angle's Class II, division 2.

A profile X-ray was taken of each child; barium paste was smeared on the lips in the midline to show clearly the inner surfaces of the upper and lower lips. A cephalometer was not available for this work. The X-rays were taken with an ordinary dental X-ray machine at a target film distance of 3 ft. The central ray was centred on the lips (*Fig.* 1).

* Paper read at the Country Meeting of the British Society for the Study of Orthodontics held at Sheffield, Friday, May 6, 1955.

The parts being examined and measured, the lips in the mid-sagittal plane, and the upper incisor teeth are so near to one another —indeed, touching one another—that the effects of non-parallelism will have an effect on accuracy or distortion which is scarcely significant. However, the effects of enlargement of the image due to the divergent X-rays will have to be taken into account if measurements are to be made directly on the X-ray film. This increase is measurable (Logan, 1938) and in the present instance, with a target film distance of 3 ft. and an object film distance of about 3 in., is approximately 10 per cent—a convenient figure where calculation in decimals is concerned.

It was realized that there was scope for considerable error during the procedures of taking the X-rays and measuring the resulting tracings. The lower jaw and the lips, being exceedingly mobile structures and subject to the will and emotions of the patient, might present differences in relationship even under the scrutiny of the operator taking the X-rays. Five cases were therefore X-rayed twice, i.e. by two entirely separate operations. The resulting ten tracings were measured in a random order and the measuring errors calculated.

The method of measuring the tracings was as follows: The occlusal plane as used by Downs was drawn in (Downs, 1948). (The plane is represented by a straight line bisecting the first molar cusp height and the incisal overbite.) This line was projected forward beyond the incisors and lines parallel to it were drawn, the lower just touching the incisal edge of the upper incisor and the upper line the highest point on the curve of the lower lip. The distance between these last two parallel lines was measured in millimetres and represents the level of the lip line above the incisal edge of the upper central incisor teeth (A in *Fig.* 2).

RESULTS

Of the 30 cases of normal occlusion, 27 values were used in the statistical analysis. The remaining 3 cases fell well outside the range and were omitted from calculations. The measurements were made to the nearest tenth of a millimetre.

In 27 cases of normal occlusion the range was shown to be 2·8 mm. to 7·0 mm., with a mean of 4·8 mm. and a standard deviation of 1·2. The correction for measuring errors

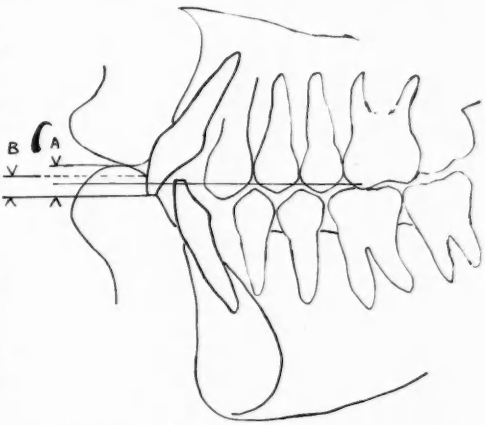


Fig. 2.—Tracings of X-ray showing: A, Total height of lip above incisal tip of upper central incisors; B, Height of lip in contact with central incisors.

amounted to half the observed variations (*Fig.* 3).

In the group of 8 Angle's Class I malocclusion, if one value which is well outside the range is left out, a range of 2·5 mm. to 5·9 mm., with a mean of 4·6 mm. was obtained. This shows no appreciable variation from the normal.

The three values for Angle's Class II, division 2, were measured as 5·8 mm., 6·0 mm., and 7·1 mm.—all are above the mean value for normal (*Fig.* 4). Conclusions cannot be drawn from so few cases.

In the Angle's Class II, division 1, cases, the measurements could not be made as in every case the lower lip was below the level of the tip of the upper incisors.

With the kind permission of Mr. C. F. Ballard, I was able to make tracings of a number of cephalometric X-rays at the Eastman Dental Hospital, London. Some of these X-rays were of the patients who had had no orthodontic treatment as yet, and some were

of patients who were either under treatment or had had their treatment completed. A strikingly similar range of values was obtained.

In the untreated cases, Angle's Class I malocclusions showed a range of 2·5 mm. to 7·0 mm., with a mean of 4·8 mm. in a group of 21 cases. Two were omitted from the calculation, where there was no coverage by the lower lip. Two cases of Angle's Class II, division 2, showed readings of 6·3 mm. and 6·9 mm., once again being above the normal mean value. In 18 treated cases the range was 2·8 mm. to 7·0 mm., with a mean of 5·0 mm.

Values have been given to the nearest tenth of a millimetre for comparison of the various groups. However, in view of the value for measuring errors, a more realistic statement of the group of normal occlusions would read: range 3 mm.–7 mm., mean 5 mm., standard deviation 1.

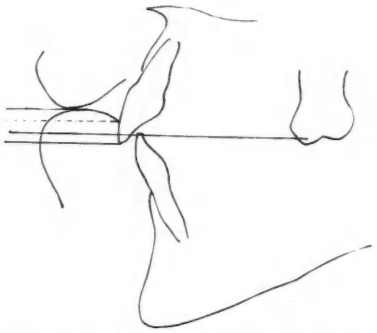


Fig. 3.—Example of a tracing in a normal occlusion.

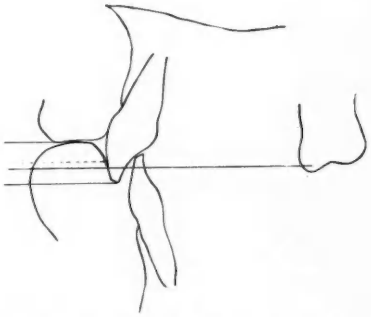


Fig. 4.—Example of a tracing in a case of Angle's Class II, division 2.

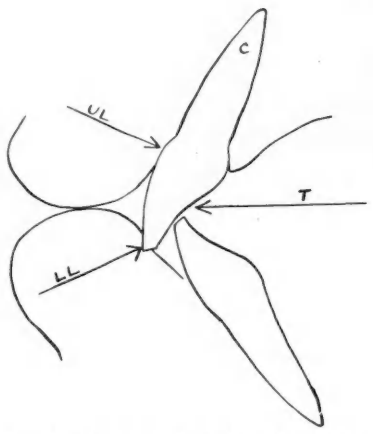


Fig. 5.—Diagram illustrating the points of application of the muscle forces controlling the incisor teeth.

This survey shows that in a normal occlusion, or in a malocclusion of a local nature, the lower lip will be found to rise above the level of the incisal margins of the central incisors to a height of 3 mm.–7 mm. The height of lower lip in actual contact with the labial surfaces of the central incisors is less than this (B in *Fig.* 2). The actual amount of lower lip in contact with the upper incisors will depend on the shape of the inner surface, both in convexity and in the shape of the junction of the upper and lower lip—the lip line. The measurement of the actual contact with the central incisors (*C* in *Fig.* 2) showed a value of about 2 mm. less than the height of lip above the incisal edge. The inner surface of the upper lip as it curves away from the junction with the lower lip may not contact the upper central incisors at all. In cases near the upper limit of values in the foregoing survey the clinical crown would have to be greater than 9 mm. in height for the upper lip to contact the enamel of their labial surfaces.

DISCUSSION

In assessing the possible effects of the inner surfaces of the lips as a controlling force in the position which the incisors will adopt, the slopes of their surfaces in relation to the teeth and the area of application must be taken into account. The inner surface of the upper lip where it contacts the dento-alveolar process is roughly parallel to it; also, being nearer the fulcrum of tipping movement of the incisor, its effort is further reduced. On the other hand, the lower lip's inner surface lies at a tangent to the labial surface of the incisor, preventing its further eruption and preventing labial tilting of the incisor at its most mechanically advantageous point. It will be seen, therefore, that the lower lip is the major controlling force in preventing the upper central incisors from being tilted labially by the thrust of the tongue (*Fig.* 5).

Fig. 6.—Lower lip held aside in a case of Angle's Class II, division 2. The lateral incisors are entirely covered by the upper lip.

From profile X-rays with radio-opaque paste on the midline of the lips, the relation of the lip to the central incisors only can be assessed. The relation of the lateral incisors to the lips will depend on the shape of the lip line, whether it is straight, curved upwards, or curved downwards. Also, it will depend on the height to which the lateral incisors have erupted or grown in relation to the lip line.

The few Angle's Class II, division 2, cases measured in this series would suggest (though not prove) that there is a greater lower lip coverage of the central incisors than in normal occlusion. This is borne out clinically. If the lower lip in a Class II, division 2, case is pulled away, a large area of labial surface of the central incisors is seen. On the other hand, the labially inclined lateral incisors are not seen—they are completely covered by the upper lip (*Fig.* 6). Is it unreasonable to postulate that in Class II, division 2 malocclusion the central incisors are tilted lingually by the control exerted by too great a depth of lower lip, while the lateral incisors receive only the weaker controlling force of the upper lip?

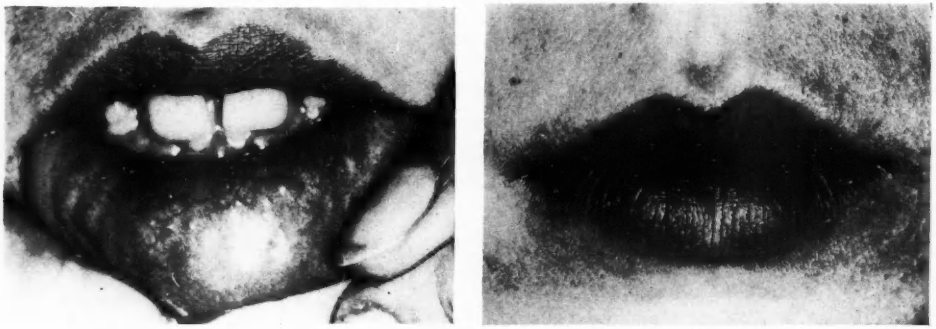
Fig. 7.—The lips in Angle's Class II, division 2 malocclusion.

Fig. 8.—The lips in Angle's Class II, division 2 malocclusion.

It was with this in mind that an attempt was made to correlate the angle at which the upper and lower incisors meet with the height

of lip line above the incisal margins of the upper incisors. This was done in the group of normal occlusions. The figures were plotted against one another on a graph, but no significant correlation was noted. However, with a larger group of Angle's Class II, division 2 orthodontists could, I feel sure, diagnose an Angle's Class II, division 2 malocclusion before the patient opens his mouth. *Figs.* 7 and 8 show this typical lip morphology.

Fig. 9 illustrates a case of deep overbite; the lateral incisors have not yet erupted, but



A B

Fig. 9.—A, The lower lip held aside to show a large area of the labial surface of the central incisors in a case of deep overbite. B, The lips of this case in repose are not typical of Angle's Class II, division 2 malocclusion.

or deep overbite cases, a similar correlation might lead to more positive results.

A lip pattern of distinctive morphology must surely exist in Angle's Class II, division 2 mal-

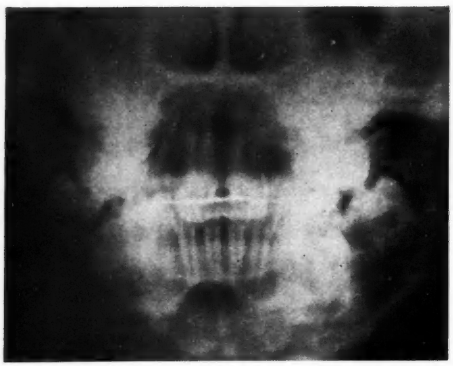


Fig. 10.—Anteroposterior X-ray with barium paste along the lip line.

occlusion. In Mr. Pringle's Presidential address this year he spoke of a case of his "giving the outward appearance of a mild skeletal II with Class II division 2 type of mouth". Most it appears that they will probably come under the influence of the lower lip and will not therefore adopt the position typical to Angle's Class II, division 2.

If much of this discussion has been concerned with Angle's Class II, division 2 malocclusion, it is because this anomaly presents a pattern of the upper incisors which will repay study. The bony and muscular elements present a typical pattern of which much remains to be learned.

Fig. 10 shows an anteroposterior X-ray with barium paste along the length of the lip line. An investigation of normal and Angle's Class II, division 2 malocclusion using this method might bring the reward of further knowledge in this field.

SUMMARY

A study of the relationship of the lip line to the upper incisors was undertaken.

A group of 44 schoolchildren attending Bristol Dental Hospital for routine dental treatment, and tracings of 39 X-rays from the Eastman Dental Hospital, London, provided the material for the investigation.

From tracings of profile X-rays, the height of lower lip above the incisal margin of the upper central incisors was measured.

In normal occlusion, Angle's Class I malocclusion, and in treated cases a very similar measurement was obtained, which can be expressed as 3–7 mm. range, with a mean of 5 mm., and a standard deviation of 1.

In the 5 cases of Angle's Class II, division 2 from both sources the values were in all cases above the mean for normal occlusion.

The possible effects of lower and upper lip control on the incisors is discussed.

Acknowledgments.—I am indebted to Mr. C. F. Ballard for allowing me to use cephalometric X-rays from his Department; to Dr. Maurice V. Stack for calculating the statistical data, and to the Bristol Medical Photography Department for the photographs.

Summary of Statistical Findings

Source of Material	Occlusion	Numbers	Lower Lip Height above Incisal Margin of Upper Central Incisors		
			Range	Mean	Actual Readings
			mm.	mm.	mm.
Sample of 44 Bristol schoolchildren	Normal	27	2·8–7·0	4·8	
	Class I	7	2·5–5·9	4·6	
	Class II div. 2	3			5·8, 6·0, 7·1
Cephalometric X-rays from Eastman Dental Hospital, London	Class I	19	2·5–7·0	4·8	
	Class II div. 2	2			6·3, 6·9
	Treated cases	18	2·8–7·0	5·0	

DISCUSSION

The President, Mr. Pringle, thanking Mr. Nicol for his paper said he thought it would be interesting if Mr. Nicol investigated the relationship of the lip positions to the deciduous dentition, with particular reference to Class II, division 2. This would make a serial study. He believed that it was more important to consider the lips in function rather than their actual resting position when they were sealed. He thought that it was also important to take all the structures into account and not just the lips. The position of the tongue had considerable significance in swallowing. He asked Mr. Hovell to open the discussion.

Mr. Hovell thanked Mr. Nicol for his paper, to which he had listened with great interest. He said that it demonstrated a definite relationship between lower lip coverage and the axial inclination of the upper incisors, and he asked whether any significant correlation had been found between the degrees of coverage and of retroclination, and from this point of view thought it would have been better to relate the coverage to the upper incisors–Frankfort-plane angle rather than the angle between the long axes of the upper and lower incisors or to the different divisions of Angle's classification.

Mr. Hovell was not sure that he agreed with Mr. Nicol's conclusion that the retroclination of the incisors was due to a high position of the stomion, but felt that the reverse was the case. When the axial relationship and central occlusal position of upper to lower incisors were disturbed by retroclination of the former, this always resulted in overeruption in both upper and lower labial segments, e.g., Class II, division 2. This overeruption of the uppers must result in a greater coverage of them by the lower lip. He thought it would be better therefore to relate the position of the stomion to the occlusal plane, and if this relationship showed a significant correlation with the degree of the incisor retroclination he would be more inclined to accept it as a possible aetiological factor.

REFERENCES

Ballard, C. F. (1948), *Dent. Rec.*, **68**, 1.
— — (1953), *Ibid.*, **73**, 669.
Downs, W. B. (1948), *Amer. J. Orthodont.*, **34**, 812.
Evans, E. Gwynne (1948), *Dent. Rec.*, **68**, 5.
Hovell, J. H. (1955), *Brit. dent. J.*, **98**, 114.
Logan, W. R. (1938), *Ibid.*, **65**, 609.
Nicol, W. A. (1954), *Dent. Practit.*, **4**, 220.
Pringle, K. E. (1955), *Ibid.*, **5**, 297.
Rix, R. E. (1946), *Dent. Rec.*, **66**, 103.
— — (1953), *Ibid.*, **73**, 427.

Lastly, Mr. Hovell would liked to have heard something about those variations outside the normal statistical range, and therefore excluded, as these extreme cases often gave valuable pointers as to aetiology. He felt that this work on a little understood type of malocclusion should be continued and extended and should produce useful information.

Mr. Kettle said that in studying cases with hare-lip there was a relationship between the position of the incisors, the thickness of the lips, and the functional activities in this region. Mr. Nicol had not mentioned this and he wondered whether he had any observations to make.

Miss Clinch said she thought it was a very interesting observation that the lower lip came up so far on the labial surfaces of the upper incisors in certain types of malocclusion. Is it always the tongue thrust that causes the upper incisors to tilt labially if the lips are not in contact at rest? She thought it was a pity that Mr. Nicol had omitted all Class II, division 1, cases from his study as it was possible to have this malocclusion and have a lip seal at rest. Mr. Nicol had shown one case which he said would not develop into the Class II, division 2, type; Miss Clinch thought that this was not a reasonable assumption.

Mr. Walpole-Day asked Mr. Nicol if he could give details of the way he prepared his barium paste and how he applied it.

Mr. Tulley said he thought that the emphasis must be placed on the function of the lips rather than their position, but that the tension of the lips in their resting position was important. He asked the question: How often are the lips at rest, and emphasized the point made by Mr. Rix in 1952 that attention must be focused on the activities of the lower lip, as the upper lip was almost physiologically redundant in relation to the position of the incisors.

Mr. Nicol, replying to the discussion, said he would like to thank those people who had offered advice for further research, particularly Mr. Pringle's remarks on the relation of the lips to the deciduous incisors as a serial study and Mr. Hovell's suggestion of reference to the incisor–Frankfort-plane angle. Mr. Nicol said in reply to several speakers that he believed function was the most important factor. He thought that the rest position of the lips indicated the resting potential for their function. He emphasized this by saying that the dynamic forces were obviously those which had the main effect, but he thought that his investigation would contribute to the overall study of aetiology. He thanked Mr. Kettle for his suggestion concerning the study of the thickness of the lips. He himself had not investigated cleft-palate cases in this respect. Replying to Miss Clinch, he said in the Class II, division 1, case that he had traced there was no actual lip coverage so that he was unable to make any measurements. He felt that he was not in a position to make a statement on the type of case where the lips actually were in contact.

With reference to the case where he had suggested that a Class II, division 2, incisor relationship would not occur with the eruption of the lateral incisors, he based this on the fact that where the line of the lips is straight, viewed from the front, it is unlikely that the upper lateral incisors will be proclined to give the typical Class II, division 2, picture; they will come under the same muscular environment as the central incisors. In reply to Mr. Walpole-Day he said that he used barium powder mixed up with very little water to form a thick paste which he injected between the lips with a hypodermic syringe to give even coverage, using it rather like a cake-icing machine. Replying to Mr. Tulley he said that he had already emphasized his views on the fact that function was the most important feature and that the lips were not at rest for any great length of time. Some people used their lips more than others.

PRELIMINARY INVESTIGATION OF MANDIBULAR GUIDANCE IN POSTURAL CLASS III CASES*

By **J. HOPPER**, L.D.S.
Orthodontic Department, Liverpool Dental School

It has been customary to divide cases of prenormal incisor relation into two main groups: (1) Those exhibiting a true mandibular prenormality; and (2) Those cases exhibiting a false or postural prenormal mandibular relationship.

In a text by Haupl, Grossman, and Clarkson (1952), A. M. Schwarz is quoted as dividing cases of prenormal occlusion into two groups —those in which "forced bite" occurs owing to inclination of anterior teeth, and those with abnormal growth in length of the mandible, without forced bite or inclination of the teeth.

It seems to be generally accepted that in the postural Class III the mandible is displaced anteriorly on closure and all that is required of treatment is a repositioning of the mandible in a distal direction.

Patients observed clinically both before and after treatment were noted to differ but little

* Given at the Sheffield meeting of the British Society for the Study of Orthodontics on Saturday, May 7, 1955.

in their buccal occlusal relationships so the question arose—was in fact the mandible repositioned distally as was current belief?

A review of the literature on the subject revealed no attempt until comparatively recently to correlate the apparent anterior mandibular positioning with the position of the condyles in the glenoid fossæ. Statements that the mandible was "forced forward" in closure or guided anteriorly, were frequently found (Erdreich, 1945; Haupl and others, 1952; Hemley, 1939, 1953; Lundstrom, 1954).

Erdreich (1945), for example, reporting details of this type of case, stated that "these cases are characterized by a linguoversion of the maxillary incisors in relation to the mandibular incisors and by a forward positioning of the mandible. None could be classified as typical Class III malocclusions which exhibit an inherent overgrowth of the mandible, but are more correctly classified under what Fisk calls the atypical type, which includes in some cases diminished maxillary growth and in others a protrusion of the mandible for convenience."

More recently Thorne (1951) examined 26 cases of prenormal occlusion and found that 10 exhibited a pure hinge movement of the condyle between rest and occlusion, 15 showed a distal displacement, and in only 1 case did there appear to be any anterior displacement and that of the order of $\frac{1}{2}$ mm. While development was taking place on methods of more accurately assessing condylar displacement, patients were selected and examined by routine clinical methods in order to find out if any anterior displacement was clearly evident.

CLINICAL MATERIAL AND METHODS

All patients attending the clinic who exhibited a prenormal incisor relationship were carefully examined and any who were obviously of prenormal mandibular base relationship were rejected for the purposes of this study.

By their very nature cases suspected of possessing anterior displacement will only exhibit a minor degree of mandibular prenormality when seen in the position of occlusion. However, it is just this matter of deciding minor degrees of disharmony in the basal relationship which is so difficult since the variation from normal to prenormal is a gradual and continuous transition.

Mandibular position reflects to the full the concept of "continuous variability" permeating the whole of biological phenomena and hence it is virtually impossible to lay down a precise point at which the mandible should be considered prenormal for any individual case.

For these reasons, in the present investigation, the cases were selected by clinical observation, rather than by resorting to some mathematical computation based on cephalometric analysis.

The majority of these cases could achieve edge-to-edge incisor relationship, a characteristic sometimes quoted as distinguishing the postural Class III type of case.

The temporomandibular joint radiographs were largely taken according to the method described by Grewcock (1953) and were obtained in the positions of rest and occlusion.

For the purposes of projecting, these films were traced and the tracings only shown on the screen, as the films themselves do not project very clearly. Original films could be examined on the viewers.

Cephalometric radiographs were taken at the rest position and in occlusion to determine the individual craniofacial skeletal pattern.

FINDINGS

In interpreting the results, the limitations of radiography, particularly oblique radiography, must be borne in mind.

It is quite possible that small movements of the condyle do occur between rest and occlusion, so producing an alteration in the relative position of the condyle to the glenoid fossa that is too small to be detected in the radiograph.

As finite points from which to measure do not exist, one must guard against being too dogmatic in one's statements.

On examining the temporomandibular joint radiographs, bearing the preceding statements

in mind, it can be seen that no displacement of the condyle anteriorly occurs between the positions of rest and occlusion. In the majority of cases the position of the condyle at rest and in occlusion coincided. (*Figs.* 1, 2.) In one or two cases there was slight distal displacement (*Figs.* 3, 4).

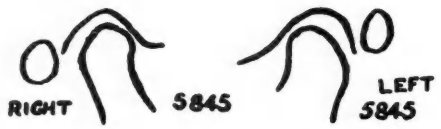


Fig. 1. *Fig.* 2.

Fig. 1.—Position of condyle at rest and in occlusion coincides.

Fig. 2.—Position of condyle at rest and in occlusion coincides.

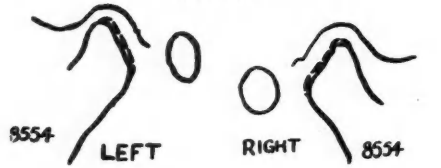


Fig. 3. *Fig.* 4.

Fig. 3.—Slight distal displacement of condyle. Rest position, continuous line; occlusal position, broken line.

Fig. 4.—Slight distal displacement of condyle. Rest position, continuous line; occlusal position, broken line.

Fig. 5. *Fig.* 6.

Fig. 5.—Position of condyle at rest position.

Fig. 6.—Position of condyle after slight labia movement of upper incisors.

It is interesting to note that if the upper incisors are moved labially to even a small extent, i.e., before they have achieved either an edge-to-edge contact or correct relationship with the lower incisors, then the condyle is in fact displaced anteriorly (*Figs.* 5, 6).

If the appliance was removed at this stage, the incisors would no doubt relapse until equilibrium was once more established in the original incisor relation and no displacement of the condyle would then occur.

Therefore considering this latter factor and on examining the cephalometric tracing of a case, it is possible that on eruption of the

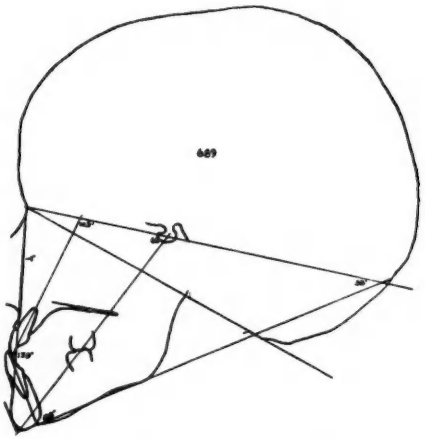


Fig. 7.—Lateral skull radiograph tracing to show teeth together.

incisors (*Fig.* 7) the upper incisors are guided, or erupt in the path of least resistance with a palatal inclination, and the lower incisors erupt with a labial inclination. Other hypotheses can account for the negative incisor relation which I will not mention here.

At this stage one might well ask what in fact does occur during treatment if one does not re-position the mandible distally?

On examination of the cephalometric tracing of a treated case (*Fig.* 8) it is apparent that the upper incisors are inclined labially and the lower incisors lingually until a normal relationship is attained, the condyle—glenoid relationship remaining relatively static. (A small degree of condylar displacement may occur until the occlusion has settled down.)

Morphologically many of these cases are described as Angle Class I. Thus, Hemley (1953) states "at times it may be impossible for the patient to establish a functional occlusion without sliding the mandible forward", and

he continues, "if the maxillary incisors have a marked lingual axial inclination, the patient may not be able to bring the posterior teeth into occlusion without sliding the condyles forward—these should be considered as Angle Class I cases."

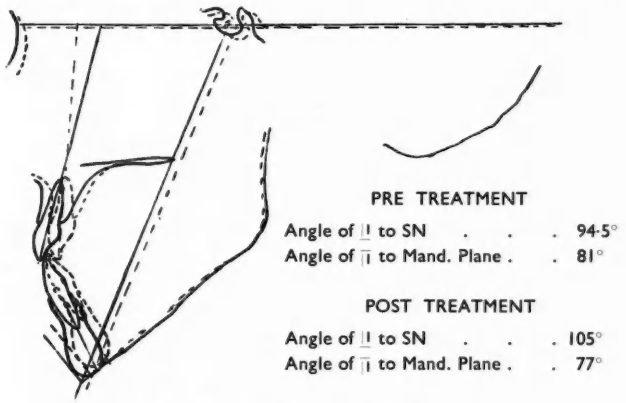


Fig. 8.—Tracings compared before and after treatment.

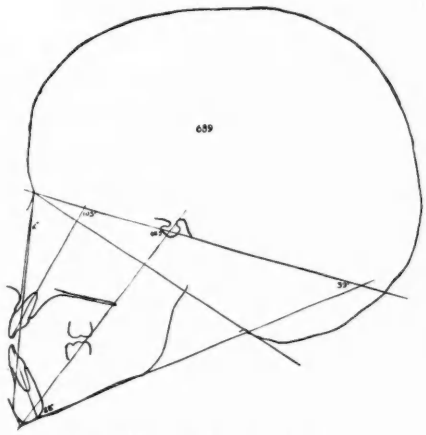


Fig. 9.—Tracing taken in rest position.

On cephalometric analysis it appears that these cases are in reality mild cases of mandibular prenormality (*Fig.* 9), though, as has been mentioned previously, it is often difficult to state definitely which side of the dividing line one would place them, whether normal or prenormal. To quote from a paper by Johnson (1950): "Both Brodie and Wylie have called for re-orientation of orthodontic thinking concerning the basis of deviations from the so-called 'normal' facial pattern and have maintained that these deviations should not necessarily be considered as defects of growth,

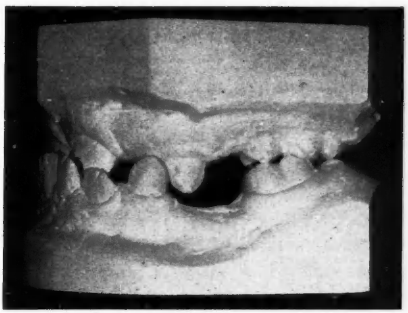


Fig. 10.—Model of the type of case.

or as undesirable postnatal alterations in craniofacial morphology, or even as abnormalities. Instead it has been suggested by them that many of these facial patterns which orthodontists find undesirable are in reality only the random combination of separate facial parts, each of which is within the normal range of variation in confirmation

and size, but which, *in toto*, combine to produce an undesirable facial configuration."

A further morphological feature of these cases was that a large number of them exhibited an increased freeway space. This could be due to faulty muscle patterning or maybe due to overloading of the buccal segments, as many patients possessed a minimum of posterior teeth (*Fig.* 10). Mr. Ballard will have something to say regarding the former in his paper, particularly in its connexion with anterior positioning of the mandible.

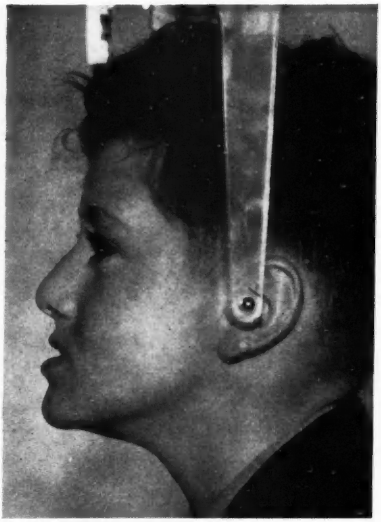


Fig. 11.—Profile in occlusion.

Fig. 12.—Profile in rest position.

Clinically, overclosure (*Figs.* 11, 12) can give the impression that the mandible is displaced anteriorly because during the over-rotation of the condyle the chin point swings further anteriorly as well as upwards towards the base of the nose.

Summing up, anterior guidance has not been demonstrated in this series of cases, though it would be rash to state categorically that it did not exist at all.

The methods used in this preliminary survey do not achieve the accuracy one would wish, particularly with regard to oblique radiography and, further, many more cases will have to be investigated than the present series of about 30.

Acknowledgements.—The writer is indebted to Mr. J. W. Softley and colleagues, of the Orthodontic Department of the Liverpool Dental Hospital, for much helpful advice and criticism; and also Mr. S. Baillie for his care in the preparation of the photographs.

REFERENCES

ERDREICH, U. (1945), *Amer. J. Orthodont.*, **31**, 269.
GREWCOCK, R. J. G. (1953), *Brit. dent. J.*, **94**, 152.
HAUPL, GROSSMAN, and CLARKSON (1952), *Textbook of Functional Jaw Orthopaedics*. London: Kimpton.
HEMLEY, S. (1939), *Amer. J. Orthodont.*, **25**, 625.
— — (1953), *Orthodontic Theory and Practice*. New York: Grune and Stratton.
JOHNSON, E. L. (1950), *Amer. J. Orthodont.*, **36**, 516.
LUNDSTROM, A. (1954), *Angle Orthodont.*, **24**, 8.
THORNE, H. (1951), *Svensk tandläk. Tidskr.*, **44**, 78.

DISCUSSION

Mr. Pringle thanked Mr. Hopper for his paper and said that he thought the preliminary investigation was a good one. What had always puzzled him was that, for example at Guy's in 1937, there were 200 children with what was called postural prenormal occlusions.

This was a small number compared to the very large number of children in London who had had deciduous molar extractions that had not gone into a forward posture. What was the factor that determined whether or not a forward posture came about? There must be skeletal III tendencies in these cases. He thought that in one of the photographs Mr. Hopper had shown, the mandible had come forward as well as overclosed. He added a note of caution over the interpretation of X-rays of the temporomandibular joint.

Mr. Hovell said that Mr. Hopper had shown by scientific observations that there was not a forward movement of the mandible in postural Class III cases which is what clinicians had thought happened. He asked whether Mr. Hopper had undertaken any electromyographic investigations on these cases and also whether the freeway space returned to normal after treatment.

Professor Hallett sounded a further note of warning about the interpretation of temporomandibular X-rays before and after treatment. He said that we still had to develop a technique for doing this and he had found by X-raying his own joint how the slightest movement could produce errors and that with our present methods only gross changes in condyle-fossa relationship could be taken into account. He pointed out that the laminagraph gave a fairly accurate method of making a "cut", but this was still open to some error.

Mr. Tulley asked Mr. Hopper the time interval between some of his X-rays taken before and after treatment. He had noticed himself that in comparing treated cases after one year, the downward and forward growth of the maxilla appeared to exceed that of the mandible following the pushing of upper incisors over the bite. This raised the problem in assessing what the treatment had actually achieved because of the unknown growth potential during the period of treatment.

Mr. Pringle said that obviously most of the speakers were dissatisfied with the techniques of joint radiography when making measurements of joint movement. He said that it was difficult to be sure that it was really scientific. He asked Mr. Hopper to reply.

Mr. Hopper in reply to Mr. Pringle, said he agreed that the skeletal morphology was the triggering factor in deciding negative incisor relationship. There were other possibilities, which no doubt Mr. Ballard would mention, the incisors erupting, edge-to-edge contact and, to avoid that contact, the forward positioning of the mandible, which is perpetuated and aided, he thought, by the lack of posterior teeth, the patient had to bite on the incisors and the only way they could go was anteriorally.

With regard to Mr. Pringle's question about the photograph, upward rotation of the lower incisors and chin point in overclosure always carried this point into a more anterior position relative to the normal, but was not an indication of bodily forward movement of the mandible.

In answer to Mr. Hovell he did not use an electromyograph to analyse his cases, but he hoped to do so in the future. He would expect to see electromyographic changes in these cases.

In reply to Mr. Tulley he said that the time between the X-rays was about 3 sec. They were taken with the patient or tube position at rest and in occlusion. He agreed that in making any assessments of before and after treatment, interpretation was very difficult owing to the inability to standardize X-ray technique. The changes were too small often to be accurately interpreted.

A LINGUAL APPLIANCE FOR MESIODISTAL TOOTH MOVEMENT*

By **A. G. HUDDART**, B.D.S., F.D.S., D. Orth.
Orthodontic Department, Turner Dental School, Manchester†

THIS appliance is particularly useful for the unilateral or bilateral retraction of lower canines and premolars, although any incisor, canine, or premolar may be moved along the line of the arch in the same way.

It is not suitable in the upper arch in cases with an excessively deep overbite as the lower incisors tend to bite on it.

The appliance consists of a lingual arch in 1-mm. round wire attached to bands on the molar teeth in the usual way.

This arch carries a sliding arm (or two, if bilateral movement is required) made by wrapping 0·4-mm. wire around the lingual arch and leaving one end projecting to hook round the tooth to be moved (*Figs.* 1, 2). To prevent this arm slipping off the tooth, it is ligatured to a twin wire arch channel attached to the tooth (*Fig.* 3).

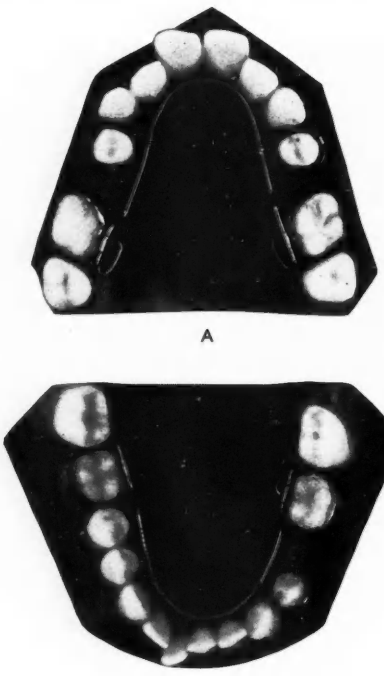
Pressure is provided by a coil spring of 0·15-mm. wire wound on 0·9-mm. wire. Activation is achieved by stretching this beyond its elastic limit, on 1-mm. wire, and then compressing it again as much as possible. In this way all the coil springs used are activated to more or less the same degree.

* Demonstration given at the Country Meeting of the British Society for the Study of Orthodontics, held at Sheffield, May 7, 1955.

† The author has now joined the staff of the Orthodontic Department, Liverpool Dental Hospital.

In unilateral cases the spring works against the sliding arm at one end and against a small stop of 0·7-mm. soft wire at the other. This is welded to the lingual arch out of the way of the two sliding arms (*Fig.* 1A). If adjustment is required in these cases, any of the following ways may be used:—

1. A previously unactivated portion of the coil spring may be opened (*Fig.* 2).



A

B

Fig. 1.—A, Upper appliance. Bilateral retraction using reciprocal spring action. B, Lower appliance. Unilateral spring action. Note the small stop on the lingual arch in $\overline{43}$ region.

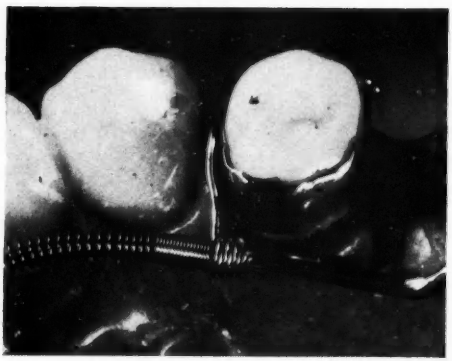


Fig. 2.—Close-up of sliding arm and one end of the compression spring. Note the unactivated portion of spring next to the sliding arm, kept for adjustment in bilateral retraction cases.

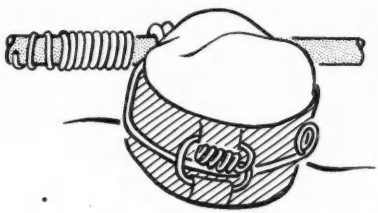


Fig. 3.—Composite spring showing how the two halves wind on to each other.

Fig. 4.—Twin wire arch channel with sliding arm ligatured to it.

Fig. 5.—Drawing of the stop on the lingual arch. Note the compression spring, active on one side and passive on the other.

the tongue in the opposite canine or premolar region (*Figs.* 4, 1B). The pressure of the coil spring on the sliding arm can be rapidly adjusted by screwing the spring past the stop, increasing or decreasing the amount of spring between the stop and the sliding arm.

In bilateral cases this technique is not used. Instead, the spring action is reciprocal between

2. New lengths of coil spring may be wound on to the lingual arch.

3. The spring on the lingual arch is initially in two halves which are wound into each other. To increase the activation of this composite spring, the two halves may be unwound as desired in order to increase its effective length (*Fig.* 5).

INCOME TAX WEAR AND TEAR ALLOWANCES

By **JOHN LYMESTER**

EVERY dentist in practice has for the purposes of income tax certain machinery and plant which he uses in the course of his profession, and for which he can claim deductions for wear and tear to reduce his taxation liabilities.

Thus his fixtures, fittings, and furniture are so classified, and also his private motor-car if he uses it in the course of his profession, besides his various items of equipment, etc. When the financial accounts are submitted to the Inspector of Taxes for the purposes of assessment to income tax the Inspector disallows the charges for depreciation and losses on sales of machinery and plant and adds the amounts thereof to the profits. Conversely profits on the sale of such assets are ignored.

Afterwards in lieu thereof a deduction is made for the Capital Allowances for Wear and Tear of the machinery and plant.

The Finance Act 1954 contained details in respect of a new Investment Allowance for capital expenditure on new assets after April 6, 1954, and the wear and tear allowances are now granted as follows:—

a. Investment Allowance.—An allowance of 20 per cent (one-fifth) of the cost of new machinery and plant purchased after April 6, 1954. The allowance is not granted for used or second-hand machinery or plant.

Motor-cars are classified as machinery and plant, and for those used in business wear and tear allowances are granted, but the investment allowance is not granted for road vehicles unless they are of a type not commonly used as private vehicles and are unsuitable to be so used, or are provided wholly or mainly for hire to or for carriage of members of the public in the ordinary course of a trade. Therefore private cars do not qualify unless they are for hire purposes.

Fixtures and fittings, office machinery, and other items are classified as machinery and plant, and expenditure thereon qualifies for the allowance.

The investment allowance is granted even if the capital expenditure is allowed as a deduction from profit because the machinery and plant was dealt with on a "renewals" basis.

The investment allowance is not taken into account when calculating other allowances and is therefore a tax-free bonus.

It is granted as and when the expenditure is incurred, and, therefore, if machinery and plant is acquired on hire-purchase terms the allowance is granted as and when the deposit and instalments are paid.

The investment allowance is granted in the income tax year in the basis financial year for which the expenditure is incurred. Thus if it is incurred in a financial year ending in the year to April 5, 1955, the investment allowance will be granted in the income tax year 1955–6. A certificate stating that the expenditure has been incurred and the purposes for which it is to be used must be annexed to every claim for investment allowances.

b. Initial Allowances.—If the expenditure was incurred on or before April 6, 1954, or the machinery or plant was used or second-hand it does not qualify for the investment allowance but for an initial allowance. The rate of initial allowance is now 20 per cent; previously from April 6, 1949, to April, 1952, the rate was 40 per cent. The initial allowance was suspended from April 6, 1952, to April 14, 1953, and was restored for expenditure on and after April 15, 1953, at 20 per cent. Prior to April 6, 1949, from April 6, 1946, it was 20 per cent.

The initial allowances are taken into account in calculating other allowances.

Initial allowances are granted in the income tax year in the basis financial year of which the expenditure is incurred and are granted for machinery and plant acquired on hire-purchase terms as and when the deposit and instalments are paid.

c. Annual Allowance.—In addition an annual allowance is granted for each income tax year, if at the end of the basis financial year the machinery and plant is still in use in the trade. This annual allowance is a fixed percentage of the written-down value at the end of the

previous income tax year. For motor-cars the rate of annual allowance is usually 20 per cent, for office machinery 10 per cent, and for fixtures and fittings usually 5 per cent. For equipment it varies according to the type and the expected period for which it can be used.

d. Additional Annual Allowance.—An addition of one-fourth is made to the Annual Allowance calculated above for each income tax year.

e. Balancing Allowance or Balancing Charge.—If the machinery and plant is sold, scrapped, or destroyed and the amount realized is less than the written-down value for income tax purposes, a further allowance equal to the difference is made, which is known as a Balancing Allowance—that is if the sale price and the allowance granted do not equal the cost price. The investment allowance is for this calculation ignored.

f. Balancing Charge.—If the proceeds are more than the written down value then the difference is assessed to income tax by means of a Balancing Charge. Alternatively, if the machinery or plant is replaced, the amount of any balancing charge may be deducted from the cost of the new machinery and plant which, of course, reduces the allowances in respect of the new machinery in future years.

To illustrate these allowances let us assume that a dentist purchases new equipment in January, 1955, for £500 and sells it five years later for £100. He prepares accounts to March 31 in each year, therefore his capital allowances if the rate of wear and tear is 7½ per cent in respect thereof are as follows:—

	Per cent	£	£	£
1955–6—				
Cost			500	
Investment Allowance	20			100
Annual Allowance	7½	38		
Add one-fourth ..		10	48	48
Written down value			452	148
1956–7—				
Annual Allowance ..	7½	34		
Add one-fourth ..		9	43	43
Written down value			409	
1957–8—				
Annual Allowance ..	7½	31		
Add one-fourth ..		8	39	39
Written down value			370	
1958–9—				
Annual Allowance ..	7½	28		
Add one-fourth ..		7	35	35
Written down value			335	
1959–60—				
Annual Allowance ..	7½	26		
Add one-fourth ..		6	32	32
Written down value			303	
1960–1—				
Sale Price			100	
Balancing Allowance			203	203

The loss by wear and tear is £400, that is the cost of £500 less the sale price of £100, but to this £400 the £100 investment allowance has to be added, giving total wear and tear allowances of £500, granted as follows:—

	£
1955–6	148
1956–7	43
1957–8	39
1958–9	35
1959–60	32
1960–1	203
	£500

If the equipment had not qualified for the investment allowance, the wear and tear allowance granted would have been as follows:

	Per cent	£	£	£
1955–6				
Cost			500	
Initial Allowance ..		100		
Annual Allowance ..	7½	38		
Add one-fourth ..		10	148	148
Written down value			352	
1956–7—				
Annual Allowance ..	7½	27		
Add one-fourth ..		7	34	34
Written down value			318	

	Per cent	£	£	£
1957–8—				
Annual Allowance ..	7½	24		
Add one-fourth ..		6	30	30
Written down value			288	
1958–9—				
Annual Allowance ..	7½	22		
Add one-fourth ..		5	27	27
Written down value			261	
1959–60—				
Annual Allowance ..	7½	20		
Add one-fourth ..		5	25	25
Written down value			236	
1960–1—				
Sale Price			100	
Balancing Allowance			136	136

The loss on the equipment by wear and tear is, as before, £400, and this has been allowed as follows:—

	£
1955–6	148
1956–7	34
1957–8	30
1958–9	27
1959–60	25
1960–1	136
	£400

The reduction in the allowances is:—

	£
1956–7	9
1957–8	9
1958–9	8
1959–60	7
1960–1	67
	£100

which, of course, equals the investment allowance.

These wear and tear allowances, if not used in one income tax year because of a loss or insufficient profits, can be carried forward indefinitely against future profits until used.

The income tax profit does not correspond with the financial accounts. For example, the financial records would be as follows:—

	£
Year to March 31, 1955	
Cost	500
Depreciation at 7½ per cent for three months	10
	490
Year to March 31, 1956	
Depreciation at 7½ per cent p.a. ..	37
	453
Year to March 31, 1957	
Depreciation at 7½ per cent p.a. ..	34
	419
Year to March 31, 1958	
Depreciation at 7½ per cent p.a. ..	31
	388
Year to March 31, 1959	
Depreciation at 7½ per cent p.a. ..	29
	359
Year to March 31, 1960	
Sale Price	100
Loss on Sale	259

LETTER TO EDITOR

Aug. 31, 1955.

Dear Sir,

In his article on "Orthodontics in the Hospital Service" in the DENTAL PRACTITIONER of August, 1955, Mr. J. D. Hooper claims, "In 1950 the South-west Metropolitan Regional Hospital Board advertised for a Consultant Orthodontist to be appointed to the Bournemouth and East Dorset Group of Hospitals. This was the first time that a Regional Hospital Board had proposed to add an orthodontist to its Consultant Staff".

It is time that this mis-statement is corrected. I speak for the Western Regional Hospital Board for Scotland only. In 1948, when the Health Act came into operation, three Consultant Orthodontists were appointed under this Regional Hospital Board.

Yours sincerely,

JAS. AITCHISON.

The Glasgow Dental Hospital and School,
211 *Renfrew Street,*
Glasgow, C.3

BOOK REVIEWS

LEHRBUCH DER ZAHNHEILKUNDE. By Professor Dr. med. KARL HÄUPL, Director of the Westgerman Dental Clinic in the Medical Academy, Düsseldorf. Second Edition. $9\frac{3}{4} \times 7$ in. Vol. I, pp. 724 + xvi, with 696 illustrations (36 in colour); Vol. II, pp. 759 + xvi, with 777 illustrations. 1953. Vienna: Urban and Schwarzenberg. DM.60 each volume.

THE compiling of a complete and comprehensive handbook of clinical dentistry by a single author is a bold undertaking. The quality of Professor Häupl's work does credit to his versatility and his painstaking effort to bring each section of the book right up to date.

To compress so much material into a mere 1483 pages calls for a certain amount of condensing and trimming. The author wisely chose to be brief in his review of first principles and dated methods, devoting much greater detail, on the whole, to the description of recent research and modern technique.

This feature particularly recommends the book to the general practitioner as a means of ready reference, and to bridge the gap between qualification and the present day. The advanced student will find it compact and useful for revision. To the owner of a private dental library it will afford the opportunity of bringing all his standard text-books up to date by a single new purchase.

The subject matter covered ranges from Anatomy and Physiology to the treatment of fractures, from Pathology to Dental Mechanics and the science of materials.

Häupl was one of Andresen's earliest collaborators and co-author of his book *Functional Jaw Therapy*. More recently he was associated with Grossmann and Clarkson in producing an English text-book on the same subject. It is therefore only to be expected that the section on Orthodontics in the present work is of outstanding merit. The practical side is confined almost entirely to the use of the activator and illustrated by a selection of excellent treated cases. There is also a review of Häupl's investigation into the tissue changes during and subsequent to Orthodontic treatment. The illustrations throughout the book are plentiful and of good quality, particularly the reproductions of radiographs and of histopathological material.

The main source of criticism, and one which may well be obviated in later editions, is the absence of a bibliography. This omission, also noted in other recent continental text-books, greatly reduces the reference value of the book. It is hoped that the publishers will pay attention to this major weakness in an otherwise excellent production.

H. L. E.

A MANUAL OF ORAL EMBRYOLOGY AND MICROSCOPIC ANATOMY. By DOROTHY PERMAR, Assistant Professor of Dentistry, College of Dentistry, Ohio State University. $10\frac{3}{4} \times 7\frac{7}{8}$ in. Pp. 109, with 49 illustrations. 1955. London: Henry Kimpton. 28s.

THE preface of this work is far too reserved. It makes it quite clear that the book is written for dental hygienists, and he who reads no further than the first two pages has no idea what is missing. Oral embryology and histology are described in a clearer and more concise manner than ever before.

The text is printed in the form of typescript and profusely illustrated by beautifully drawn pictures of the different microscopical appearances of the structures. This style is most pleasant, refreshing, and easy to read.

Sincerity, simplicity, and style are perhaps the keynotes of Professor Permar's book. Wherever opinion is divided she states so quite simply by such phrases as "the mechanism of tooth eruption is a controversial subject", "whether or not nerves extend into the dentinal tubules is a subject of controversy", and "the precise manner and degree of its [*epithelial*] attachment to the tooth surface is a subject of some controversy". These statements, which avoid the lengthy description of many different theories, will be welcomed by all except the research worker, who, in any case, is not going to be satisfied

by reading anything other than the original papers.

The underlining of words when mentioned for the first time will also help anyone using this book as an introduction to the subject, whilst the habit of stating the origin of the words used, e.g., ectoderm (*ecto* = outside; *derm* = skin) has much to commend it.

Some will consider that this book is too brief, but in the opinion of the reviewer it is a superb work which can not only be recommended to the dental hygienists for whom it was written, but also to all undergraduate students, while many more senior members of the profession would find that a couple of hours spent digesting its contents would be very beneficial.

A. B. W.

DIE FUNCTIONELLE ORTHOPÄDIE DES KAUSYSTEMS. By Prof. Dr. med. JOSEF ESCHLER. $9\frac{1}{2} \times 6\frac{3}{8}$ in. Pp. 223, with 172 illustrations. 1952. Munich: Carl Hanser. 16 Dm.

PROFESSOR Eschler, a follower of the Andresen-Häupl school, has produced a commendable text-book on "Functional Orthopædics of the Masticatory System".

One section of the book may be of particular interest for readers in this country not previously acquainted with Eschler's recent work. In it he describes his experiments to support the contention that the Andresen appliance (Activator, Monobloc) induces reflex functional contractions of the orofacial musculature during sleep, thereby bringing about the tissue changes characteristic of this treatment method.

Using an electromyograph the contractions of the masseter, temporalis and orbicularis oris muscles during sleep were recorded with some interesting results: Without appliance only 7 contractions were recorded during the standard 4-hr. observation period, corresponding to body movements and swallowing in normal sleep.

The use of an activator with a simple vertical opening of the bite of 3 mm. produced 79 contractions in a similar period, and an opening of 6 mm. 142 contractions.

An extreme opening of 10 mm. produced continuous, violent contractions for half an hour, followed by a period of fatigue and then renewed activity. The patient woke frequently, and muscle and joint pains were complained of. 238 contractions occurred in 4 hours.

Mandibular forward placement of 5 mm. combined with an opening of 4 mm. produced 109 contractions.

To demonstrate that these contractions resulted in increased appliance-tooth contact, a further experiment was carried out. One tooth was banded and a small metal plate placed in the opposing facet of the activator. Tooth and plate were wired to a battery, so that contact between the two resulted in closure of a circuit and flashing of a small light-bulb. Readings were obtained which corresponded exactly to the muscular contractions recorded.

From these experiments it is concluded that for the achievement of optimal results the degree of bite opening and advancement is critical in each case, because excessive as well as insufficient stretching of the musculature in the "working position" results in reduced activity.

The book as a whole is well produced, concise, and contains 172 illustrations. Unlike a number of recently published dental text-books of continental origin, it includes a useful bibliography.

H. L. E.

PRINCIPLES AND PRACTICE OF ANTIBIOTOC THERAPY. Edited by HENRY WELCH. $8\frac{3}{10} \times 5\frac{1}{2}$ in. Pp. 700. Second edition. 1954. New York: Medical Encyclopedia Inc.

SUFFICIENT time has now elapsed since the discovery of penicillin and the subsequent development of a vast number of substances having similar properties, to be able to make a critical evaluation of the whole range of therapeutic drugs which are grouped together under the title of "antibiotics".

The dental profession, in common with all branches of medicine, has found the antibiotics invaluable in the treatment of many infective conditions in, and associated with,

the mouth, ranging from the most serious complications of dental infection, such as cellulitis and osteomyelitis, to the infected non-vital tooth.

The scope of this book is very wide. It is divided into sections the first of which deals in detail with each of the antibiotics now in common use—Penicillin, Streptomycin, Chloramphenicol, the Tetracyclines, and Bacitracin, to mention the most important. The history of their discovery and development, antimicrobial activity, chemical structure, pharmacology, and dosage are fully discussed. This section concludes with a chapter on the interesting phenomena of synergism and antagonism with reference to antimicrobial substances. Part II is concerned with antibiotic therapy of infectious diseases, each chapter being contributed by a recognized authority in each particular field. Part III, which contains the chapter directly concerning dental practitioners is entitled "Antibiotic Therapy in Medical Specialities". Chapter XXVI is contributed by H. A. Zander and H. B. Clark, the former of whom has conducted a great deal of research into the application of antibiotics to dental problems, in particular the control of caries. It is to be expected, therefore, that the information should be authoritative and comprehensive, although of necessity the chapter is somewhat concise. There is a valuable table giving the antibiotic of choice, form, and dosage for all oral conditions where antibiotic therapy is indicated and the chapter concludes with an extensive bibliography.

While this is essentially a book of primary interest and importance to the physician and bacteriologist, any dental practitioner who wishes to keep abreast with developments in this very important field will find it of absorbing interest. The various contributors under the guidance of the editing author have produced a volume which is a notable addition to the literature on chemotherapeutics.

D. F. S.

NEWTON HEATH TECHNICAL COLLEGE

THE following courses based on the syllabus leading to the examination for Licentiate of the Institute of British Surgical Technicians, are available during the 1955–6 session now commencing. Further particulars may be obtained from the Registrar.

Full Denture Techniques.—Lecture and practical work in full denture prosthesis, including study of mouth tissues, denture design, and application of bite recording using both plain-line and anatomical articulators.

Partial Denture Techniques.—Lecture and practical work in types of partial dentures, classification, design, and study of operative forces of mastication. Methods of retention.

Orthodontics.—Lecture and practical work in anatomy, classification of mouth conditions, types of appliances, and application of forces.

All subjects will include a study of dental materials and their chemical and physical properties.

Management and costing for small workshops may also be taken as an additional subject.

BOROUGH POLYTECHNIC

Dental Technology

PART-TIME day and evening classes begin on the week commencing Monday, Sept. 26, 1955.

Students must attend for registration in the previous week as follows:—

Former Students: Monday and Tuesday, Sept. 19, 5.30–8.00 p.m.

New Students: Wednesday and Thursday, Sept. 21, 5.30–8.00 p.m.

Courses Available:

City and Guilds: Intermediate and Final; Advanced Orthodontics; Advanced Crown and Bridge-work.

Special Courses:

Dental Mechanics (*practical only*) for students wishing to improve their knowledge and skill in the craft.

Partial dental construction including *Chrome Cobalt.*

Alloys. Crown and Bridge-work, including *High-fusing and Low-fusing Porcelain.*

Prospectus may be obtained from: The Secretary, Borough Polytechnic, London, S.E.1.

THE PROCEEDINGS OF THE BRITISH SOCIETY OF PERIODONTOLOGY

President: F. E. HOPPER, B.D.S., F.D.S. R.C.S.

Hon. Secretary: A. BRYAN WADE, B.Ch.D., F.D.S. R.C.S.,
The Royal Dental Hospital, Leicester Square, London, W.C.2

Vol. V, No. 8 September, 1955

ANNUAL CLINICAL MEETING, 1955

TABLE DEMONSTRATIONS

SOME LESIONS OF THE ORAL MUCOSA

By **E. D. FARMER,**
M.A., M.D.S., F.D.S. R.C.S.
University of Liverpool

Changes in the oral mucosa occurring in acute herpetic stomatitis and recurrent aphthous stomatitis were demonstrated. Primary acute herpetic stomatitis in adults and its sequelæ were illustrated by colour transparencies and photomicrographs. The diagnosis of the condition was confirmed by biopsy, virus isolation, and serological investigation.

Photomicrographs were shown of biopsy material taken at a stage prior to ulcer formation from patients who had a long history of recurrent aphthous stomatitis. The changes seen in the epithelium were similar in the three cases examined. The early lesions were manifest clinically as a small raised area covered by an easily removed greyish-white membrane and surrounded by a narrow reddened margin.

FURTHER CLINICAL AND LABORATORY INVESTIGATIONS WITH ANTIBIOTICS IN THE TREATMENT OF ACUTE AND SUBACUTE ULCERATIVE GINGIVITIS

By **R. TAYLOR HEYLINGS,**
M.B., Ch.B., B.Ch.D.
Department of Periodontology, University of Leeds

This demonstration illustrated by means of photomicrographs and placards the very effective action of aureomycin hydrochloride troches (15 mg.) in eliminating Vincent's spirochætes and fusiform bacilli from the mouth in cases of acute and subacute ulcerative gingivitis. It also demonstrated how rapidly symptoms were relieved by these means.

In no cases were more than twelve troches prescribed, nor was this treatment spread over more than two days.

In one case, where only six troches were prescribed, the patient said there was marked relief from pain *within six hours.*

It was notable that up to the time of the demonstration, none of the patients had had any recurrence.

It was stressed that this was *not recommended* as a routine treatment for acute and subacute gingivitis. The various side-effects which may occur following the use of antibiotics were discussed, along with methods of minimizing them. The actual slides from which the photomicrographs were taken were demonstrated under the microscope, using an oil-immersion lens, and these slides showed very clearly how quickly aureomycin hydrochloride, even in a very small dose, eliminated the majority of organisms from the oral cavity.

It was noted that in no cases had *Candida albicans* shown itself in the bacterial smears. Too much significance could not be attached to this, as cultures for *C. albicans* were not attempted. (*N.B.*—Since the demonstration a further case has shown *C. albicans* growth in more than normal amounts and this is a possible complication which cannot be ignored.)

The demonstration stressed other dangers inherent in the use of antibiotics in lozenge form, i.e., encouragement of resistant strains, glossitis, sore throat, and upset of gastro-intestinal flora.

Conclusion.—Aureomycin hydrochloride (15 mg.) troches are very effective in eliminating the infection in acute and subacute ulcerative gingivitis, and rapidly relieve symptoms in these conditions.

The treatment must, however, be reserved for special cases, and be very carefully controlled. Much more investigation is necessary before this method of treatment can be recommended for use in general practice.

REMOVABLE PERIODONTAL SPLINTS

By **C. A. O'SULLIVAN,** B.D.S.
Department of Periodontology, Institute of Dental Surgery, University of London

The case histories, photographs, and X-rays of four patients for whom removable periodontal splints were fitted were shown in this demonstration.

A variety of splints, lent by patients for the meeting, was shown in position on models.

Chrome-cobalt was the alloy of choice and its use where maximum strength and minimum bulk are needed was illustrated.

The effective use of this metal in the fixation of anterior teeth by means of mesiodistal grips was stressed.

PERIODONTAL SPLINTS

By **J. R. TROTT,** B.D.S.
Department of Periodontology, Royal Dental Hospital of London School of Dental Surgery, University of London

Splinting of injured parts to assist in the healing process is well recognized in general medicine and surgery. In dentistry, however, it is not common practice to splint teeth except in cases of direct trauma. It can, however, be used not only to rest the teeth and supporting structures following operation, but also as an integral part of occlusal equilibration, where mutual support of mobile and non-mobile teeth can be given as a therapeutic measure.

Three types of splint were demonstrated: (1) Temporary; (2) Permanent-removable; (3) Permanent-fixed.

Temporary Wire Splint.—Two types of wiring were shown as a means of temporarily splinting the $\underline{1}|$ during the treatment of two periodontal abscesses, one lateral and the other peri-apical. In both cases the teeth were very mobile and the splints were applied to immobilize the teeth after operation.

In the figure-of-eight wiring, 0·4-mm. soft brass wire is passed around the $\underline{|1}$ and in a figure-of-eight fashion through the interdental spaces to a non-mobile tooth, and then tightened, interproximally. It is easy and quick to apply, but probably does not give as much immobilization of the teeth as the other type of wiring (*Fig.* 1A).

The interdental form of wiring is done with 0·4-mm. soft stainless-steel wire. First a master wire is passed completely from one sound abutment tooth to another and tightened into place. Separate wires are then passed interdentally around the master wire and tightened, the ends being tucked back into the interproximal space labially. This takes a little longer to apply, but gives better immobilization to the teeth that require it (*Fig.* 1B).

In both instances the wiring is passed around the teeth gingival to the greatest convexity of the crowns of the teeth. The ends of the interdental wires should be tucked carefully into the interdental spaces so that they neither impinge on the gingivæ nor irritate the lips.

Permanent-removable Splints.—Two types of removable splints are shown here, although fundamentally they serve the same purpose, i.e., to give individual and mutual support to teeth which have lost much of their supporting tissues. These types of splints are particularly applicable to the mandibular teeth because æsthetically they rarely cause any embarrassment and the construction of fixed splints is not only a very difficult procedure, but often unwarranted in this area.

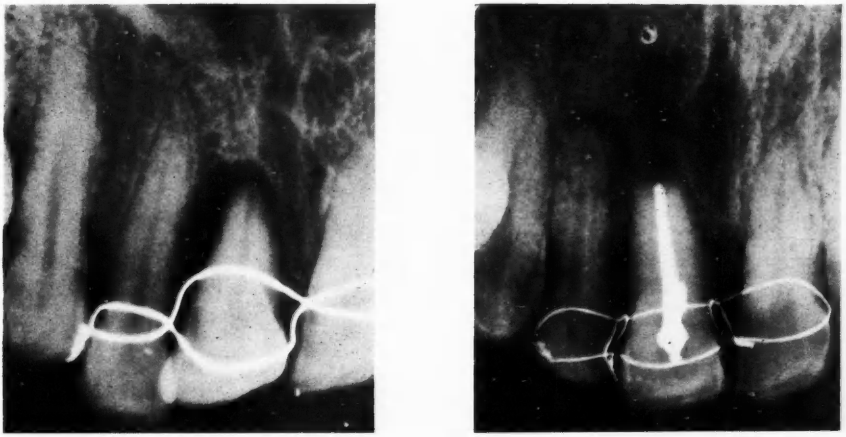
The first type is a straightforward chrome-cobalt continuous-bar precision casting. As much occlusal balance is obtained as possible by selective grinding, and teeth which will have occlusal rests are prepared at this stage. An accurate Zelex impression is taken and the model carefully surveyed.

The splint is designed so that the continuous bar covers the survey line on both the labial and lingual surfaces. A very thin bar is waxed up on the labial surface of the teeth whilst a flatter and wider bar is waxed up lingually. Then in the usual manner a cobalt casting is made and the splint fitted (*Fig.* 2A).

A similar procedure is employed when incorporating teeth on the splint to act as a partial denture. In the case illustrated the anterior mandibular teeth have been replaced, and the splint made for the mobile premolars following a gingivectomy in this region (*Fig.* 2B).

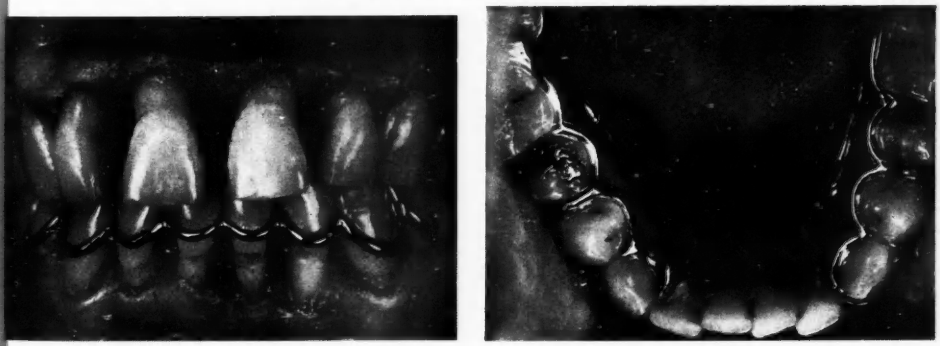
Fixed Permanent Splints.—The number of teeth to be splinted and the type of splint to be used will vary from one case to another. The case shown is one of the most difficult types and is probably the classical type used for the fixation of the maxillary anterior teeth.

Here six three-quarter crown preparations, all parallel, are made on the teeth to be



A B

Fig. 1.—A, Figure-of-eight wiring used to immobilize $\underline{1|}$. B, Interdental wiring; showing the master wire and the subsidiary interdental wires.



A B

Fig. 2.—A, A cast removable splint designed to support the mandibular anterior teeth. B, A cast splint incorporating four mandibular anterior teeth, designed as a partial denture and splinting the mandibular premolars.

splinted and the abutment teeth. Copper-ring impressions are then taken of each preparation. Six gold three-quarter crowns are cast and tried in the mouth, removed in a plaster impression, soldered together, and then cemented on to the teeth (*Fig.* 3).

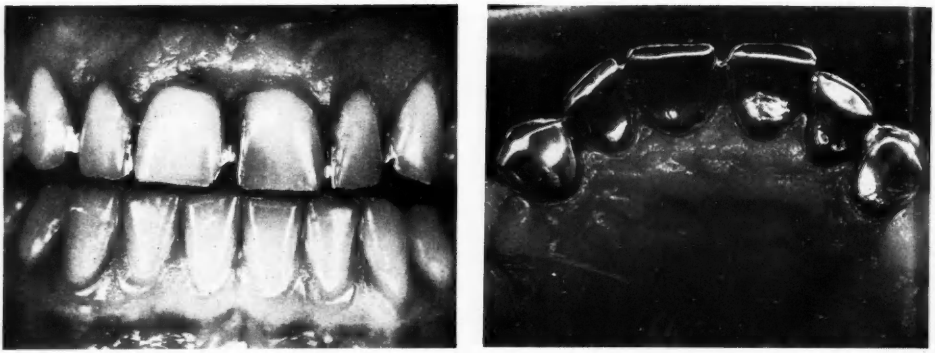


Fig. 3.—Labial and palatal view of a fixed splint, consisting of six three-quarter crowns soldered together as one unit.

There are, however, several fundamental rules to be observed before one embarks on this type of splint. First the functional occlusion must be balanced as much as possible before the preparations are started, and secondly each preparation must obey the laws of extension for prevention, retention, and resistance form. The number of teeth to be incorporated in the splint must be carefully assessed clinically, radiologically, and by a study of articulated models. Failure to carry out these procedures will lead to failure of the splint, which can be a most satisfactory line of treatment.

Illustrations of both histological preparations and radiographs showing several different types of cysts occurring in the periodontal tissues were shown by B. E. D. Cooke, F.D.S. R.C.S., M.R.C.S., L.R.C.P., of the Department of Dental Medicine, Guy's Dental School, University of London; and a new type of gingivectomy knife and pocket measuring probe were demonstrated by E. C. Fox, M.D., L.D.S. R.C.S., of the University of Birmingham.

The Meeting was completed by a showing of the United States Navy Film on Occlusal Equilibration.

INSTITUTE OF BRITISH SURGICAL TECHNICIANS (INC.)

Dental Section

THE following lectures will be given under the auspices of the Dental Section of the Institute of British Surgical Technicians:—

"Splints and Appliances used in the Treatment of Jaw Injuries", by S. Weldon Moule, F.D.S. R.C.S. (Eng.), Consultant, Regional Maxillo-facial and Oral Surgery Unit, Withington Hospital, Manchester, on Friday, Oct. 14, 1955, at 7.30 p.m. at the Turner Dental School, Bridgeford Street, Manchester, 15. Tickets are obtainable on application with stamped addressed envelope to Mr. A. Litherland, 32, Whitebrook Road, Fallowfield, Manchester.

"Dental Technology in Hospital and Consulting Practice", by R. O. Walker, L.R.C.P. (Edin.), L.R.C.S. (Edin.), F.D.S. R.C.S. (Eng.), Consultant Dental Surgeon to the Queen Elizabeth Hospital, on Thursday, Oct. 20, 1955, at 7.30 p.m. in the lecture theatre, General Hospital, Steelhouse Lane, Birmingham, 4. Tickets are obtainable on application with stamped addressed envelope to Mr. H. J. Harcourt, 8, Hillside Road, Erdington, Birmingham, 23.

ABSTRACTS FROM OTHER JOURNALS

Partial Denture Problems
The Lack of Radio-opacity in Methyl Methacrylate

A major disadvantage of this material for small partial dentures which may be swallowed or inhaled is its lack of radio-opacity.

Of the two methods used to overcome the disadvantage, the use of metal inserts was followed up after it was found that the inclusion of the salts of heavy metals into the resin had proved impracticable because of the large amount required. In regard to the use of metal inserts, two disadvantages had to be overcome, namely the production of stresses in the material as seen by polarized light and the difficulty of covering the insert completely with the denture material. Finally, the idea was given to the use of lead foil as an insert whilst viewing X-ray plates and subconsciously noting the index letters R and L which are used for orientating the film. It was considered that the lead foil would be insufficiently rigid to cause stresses yet would be radio-opaque.

The investigation was then carried out having regard to: (1) Stresses; (2) Radio-opacity; (3) Accurate location of the insert; (4) Distinct shape of insert to facilitate location of lost dentures by X-rays.

The lead foil readily available from X-ray films was used and satisfied the first two conditions.

The insert is set in the denture as follows: Pack the denture in the normal way; open the flask after the final trial closure and on the sheet of cellophane put a previously-prepared and virtually everlasting "former" which is somewhat larger than the insert is to be and which is free of sharp corners so that the cellophane will not be cut. Such a "former" may be made from lead. The flask is pressed up once again and when opened the "former" and cellophane are stripped away leaving a cavity for the reception of the lead-foil insert. This cavity is now painted with monomer, the foil carefully burnished into place and powder poured in, slightly overfull, and the flask finally pressed up and the denture processed and finished in the usual way. The method will fail if dough is used instead of monomer and powder. The possibility of lead-poisoning is to be avoided by ensuring that the denture material completely covers the foil and the foil itself may be masked if unsightly by sprinkling a little titanium dioxide into the cavity and over the foil before packing.

The fourth requirement was accomplished by making the insert T-shaped, the limbs of the T all being of different lengths. This irregularly-shaped T-piece is placed in the denture with the upright limbs pointing anteriorly. The larger of the arms of the T is placed to the left of the viewer when the denture has the occlusal surface facing away from the viewer.

In the case of partial dentures with isolated teeth carried on isthmuses of acrylic, a strip of foil should be included here also. The idea could be carried to acrylic crowns and foil inserted on the palatal side.—ATKINSON, H. F. (1954), *Aust. J. Dent.* **58**, 349.

Possibilities and Limitations of Expansion Treatment in Orthodontics

There are three methods by which the maxilla could be enlarged: with wire appliances; with removable plate appliances; and by bursting of the palatine suture.

Therapeutic aims of expansion treatment are: making room for a complete dental arch, and for widening of the bony framework of the nose to improve nose breathing and to activate the pituitary gland.

It is observed that the crowding of the cheek teeth cannot be remedied by expansion. Room must be made in the mesiodistal direction. Whether this should be done by a distal movement or by extraction depends on the individual case. It is better to provide for the best possible conditions for the eruption of large third molars and this is best done by extracting a premolar at an early age.

The malformations of the jaw are regarded as the result of the effects of constitution and

environmental influences, with function as a go-between. Such an environmental influence is the orthodontic appliance. The best time to expand the jaw is the time of the transition from deciduous to permanent dentition. The extent of the expansion is essential for success. One can only stimulate artificially the growth in width of the jaw provided that it is itself suitable for it and where one can eliminate obstructing environmental influences. Serial extractions would be necessary if the case in question is a narrow face with narrow nasal passages and the physical and mental development is unsatisfactory. The expansion of the dental arch also affects the nasal cavity. Expansion therefore must be undertaken where no disproportion between dental arch and apical base is likely to follow.

Separation of the palatine suture is to be carried out in cases where the upper cheek teeth incline outwards before treatment, where circumstances would contribute to the disproportion to the apical base, and where the nasal passages have to be widened.—SCHWARZ, M. (1954), *Int. dent. J.*, 4, 657.

Bleeding Tooth Sockets

It is occasionally revealed for the first time that a patient is "a bleeder" because of persistent hæmorrhage following dental extraction. It is a fact that the bleeding will not stop or recur until the process of healing is complete, and therefore it is important that the aim should be not only to stop the bleeding but to avoid delaying the healing. In such cases it is important to remember that: (*a*) plugging should not be used as it will cause eversion of the socket; (*b*) the jaws should not be clamped together with tight bandages which might cause necrosis of the tissues; (*c*) if the clotting is defective the gum margin should never be sewn together, as the blood—unable to escape—may infiltrate the tissues of the tongue and throat and cause fatal asphyxia.

The best way to treat such a case is as follows: A pledget of oxycel or calgitex, about the size of a marble, is soaked with thrombin or venom solution and moulded into the shape of a mushroom. Any loose blood-clots are washed away from the socket and the stalk of the mushroom is lightly pressed down into the cavity, the head fitting over the edges of the socket. A cotton-gauze swab or pack, of the size required to fill the gap between the socket and the opposing teeth, is then applied over the dressing, and firmly pressed into position by the thumb and forefinger, which should also squeeze the edges of the socket together. This pressure is then maintained for at least five minutes and relaxed without dislodging the cotton pack. The patient can then close his jaws and if the pack is properly placed the bite should hold it in position without excessive pressure. In almost every case this procedure will stop the bleeding for several hours, at least, though it is then apt to restart owing to the digestion of the clot. It is a great advantage to have a small dental splint made which, better than the cotton pack, will hold the coagulant dressing firmly in place. Dressing with new applications of coagulant can be repeated once or twice, but no attempt more drastic than these should be undertaken to control the bleeding. If it becomes dangerous the patient will require admission to hospital and transfusion.

It need hardly be emphasized that good conservative dentistry is particularly important for such patients, as unfortunately their teeth are often grossly and needlessly neglected. —MACFARLANE, R. G., *Brit. med. J.*, 1955, 1, 1080.

Effectiveness of the "Berliner Epithelial Scalpel" in removing the Epithelial Lining of Periodontal Pockets

This is an extremely useful review of the literature concerned. The possibilities of reattachment of the periodontal tissues is followed by a report on 30 cases in which an attempt was made to remove the epithelial lining of periodontal pockets by means of the Berliner Epithelial Scalpel. Serial sections of excised tissue which had been operated upon by this method were examined microscopically, and it was found that out of these only three cases showed complete removal of the epithelium.

The author stresses, however, that if overwhelming clinical evidence shows reattachment after the use of this instrument, then perhaps complete removal of the epithelial lining is not necessary, and concludes that "there is nothing so magic about the microscope that makes limited microscopic studies more valuable than overwhelming and good clinical evidence. Arguments, at an academic level, over reattachment should not prevent progress in clinical periodontics".—WERTHEIMER, F. W. (1954), *J. Periodont.*, **25**, 264.

Malignant Disease in relation to Dentistry

Carcinoma occupies the first place among the malignant lesions of the oral cavity. The diagnosis must be made in the early stages of its formation if the results are to be satisfactory. The best person to diagnose oral carcinoma is the dentist. It is possible that the patient himself may be quite unaware of the existence of the carcinomatous tumour because there is neither pain nor any other symptoms present but the dentist can, on very careful examination, reveal the presence of it. When any hyperplastic or ulcerated tissues do not respond to any treatment, the dentist must suspect cancer. Before treatment is prescribed or action taken it would be better to obtain a biopsy and get the pathological report on the tumour. Leucoplakia, where it is not warty or ulcerated, is not a precancerous lesion, but it must, however, be kept under observation and must not be irritated with any medicaments. Amongst other tumours in the mouth the so-called sarcomatous epulis is not considered to be a malignant tumour. It is also reported that there is no cause-and-effect relationship between prosthetic appliances and cancer of the mouth.

Intra- and extra-oral radiographs should be taken in every case. In the earliest stages of cancer the symptoms are not very conspicuous. Cancer may be found in the lip, gums, tongue, floor of the mouth, palate, cheek, and maxillary bones. In the lip cancer is of the cutaneous variety and of slow development. It can have a very deep ulceration or fissure or it may have a protruding nodule, or it may be a wart-like projection of reddish tissue implanted on hardened tissue.

Cancer of the gum occurs more frequently in the mandible than maxilla. It is often ulcerated, the ulcer having protruding edges. The fleshy part is friable and may bleed very easily. It may also protrude from the socket of an extracted tooth.

In cancer of the tongue the margin in its middle or posterior third is most commonly affected. It usually occurs in the form of ulceration, with infiltrated edges and rounded outline, and with the base covered with small reddish nodules.

In the floor of the mouth the cancer starts in the centre in the neighbourhood of the lingual frænum, or in the lateral zone. When examining the patient one should not omit to examine the base of the sulcus between the arch and the floor of the mouth.

On the palate, most frequently at the junction of the hard and soft palate, the carcinoma presents itself in the form of a small round mass of fleshy tissue with an ulcerated surface, or of a nodular plaque, in parts whitish through leucoplakia, in parts already ulcerated.

In the cheek it sometimes originates from a zone of warty and ulcerated leucoplakia in the neighbourhood of the angles of the mouth. The neoplastic tissue may appear as a cauliflower, or as an ulcer with infiltrated edges and base, with a tendency to spread rapidly.

Cancer of the maxilla is more frequent than that of the mandible. In the maxilla the usual site is the body, where the cancer develops insidiously without pain. If a loose tooth has been extracted and the socket does not close because of the presence of fungating growth, cancer of the maxilla should be immediately suspected.

In carcinoma of the mandible the symptomatology is similar to that of sarcoma, namely: neuralgia or anæsthesia in the distribution of the third division of the trigeminal nerve, mobility of teeth, and, on radiographic examination, destruction of bone tissue in an area more or less extensive, with irregular and ill-defined limits.—SARAVAL, U. (1955), *Int. dent. J.*, **4**, No. 6, 805.

Pathogenesis of Pocket Formation in Traumatic Occlusion

After a very thorough review of previous investigations and beliefs about the role of traumatic occlusion in pocket formation an experiment is reported in which 7 dogs had a crown bearing a spur fitted to a mandibular tooth, thereby considerably raising the bite and producing abnormal stress both vertically and horizontally.

The dogs were fed on an adequate diet and were given a supply of bones for gnawing, and were sacrificed after periods of from 73 to 185 days. In those cases of long duration the stresses were made intermittent by removing the crown for a number of days and then recementing it, thereby enabling an assessment of the possibility of repair subsequent to periodontal traumatism.

The findings enabled the author to conclude that under extremely unfavourable conditions a deepening of the clinical pocket below the cemento-enamel junction can be produced by undue stress. The combination of horizontal and vertical overload may produce intrusion of the tooth to such an extent that it touches the crest of the alveolar process, thereby producing necrosis of the periodontal membrane all the way to the epithelial cuff, thus enabling a downgrowth of the epithelial cells in a subsequent period of repair. A sterile necrosis within the periodontal membrane was found to cause little inflammation and is considered hardly likely to produce an inflammation in the gingival margin. Damage done to cementum, periodontal membrane, and alveolar bone can be repaired when the tooth adjusts itself in a new position. Downgrowth of epithelium is permanent damage. The supporting structures of the teeth seem to be well suited to prevent permanent damage caused by occlusal overload.—WAERHAUG, J. (1955), *J. Periodont.*, **26**, 107.

Chronic Neurogenic Desquamative Gingivitis with Bullous Formation

This is a case report of a married female, aged 34, who was considerably overweight and had borne no children. She complained of the formation of blisters on her gingivæ wherever pressure was applied. Fluid which formed in the bulla travelled along the gingival tissues between the epithelium and the connective tissue and ballooned as it did so. When this elevated epithelium collapsed the patient was able to remove a large layer of tissue, leaving a raw sensitive surface and denuded connective tissue. Oral examination supported the patient's statement. Prolonged topical treatment by an ointment containing vitamins A and D together with the surgical removal of cervical polyps, and a strict reducing diet and multi-vitamin therapy, combined with scaling and polishing and rigorous oral hygiene eventually produced keratinization of the epithelium which has been maintained with absence of bullous formation over a period of eight months.—OLDER, L. B. (1955), *J. Periodont.*, **26**, 130.

The Systemico-Oral Interdependency in Chronic Disease

The responsibility of the dentist in early recognition and treatment of oral manifestations of systemic disturbances is becoming increasingly apparent.

Systemic disease may affect the dental problem by: (1) producing oral symptoms and lesions, such as in hyperparathyroidism and in polycythemia vera; (2) producing abnormalities in oral structure and function, as for example muscular dystrophy, hypopituitarism and hyperpituitarism; (3) permitting aggravation of already established oral defects through lowering of resistance, as for example in diabetes and acute myeloblastic leukæmia; (4) altering both course and prognosis of dental treatment, as for example in rheumatic heart disease, Parkinson's disease, and Little's disease; (5) producing oral reaction as a result of the prescribed systemic therapy, as for example in avitaminosis and in epilepsy.

It is therefore imperative that the dental surgeon must broaden his scope and understanding of his place and function in maintaining the health and comfort of the people for whom he is responsible.—ROCKOFF, H. S., ROCKOFF, S. C., and SACKLER, A. M. (1955), *Oral Surg.*, **8**, No. 3, 246.